AUTOMATIC DATA PROCESSING

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EMIDEC COMPUTERS ARE WORKING FOR

BOOTS

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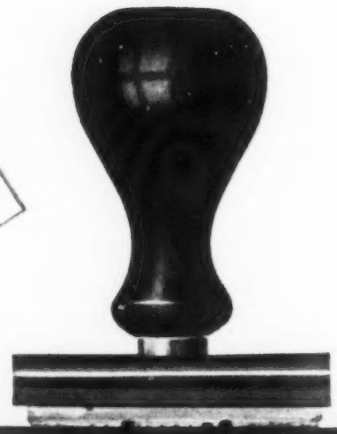
PLASTICS DIVISION



Anyone who thinks that these are just three more computers is a generation behind. For these three EMIDEC machines are the first of a generation of computers new both in concept and technique. In concept, because they were designed from the start to supply management with a full decision-aiding system; in technique, because they embody transistors and technical advances not previously available. These are the computers of the 1960's.

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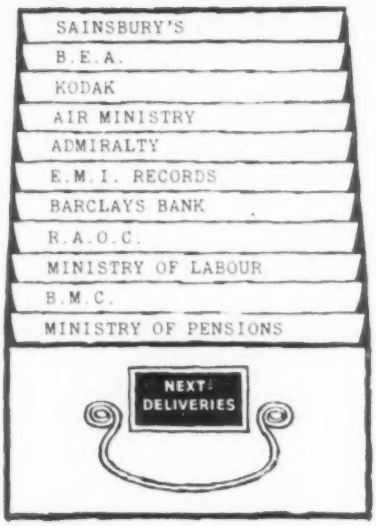

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AUTOMATIC DATA PROCESSING

JOURNAL OF MANAGEMENT AND INFORMATION SYSTEMS

VOL 2 No 12

DECEMBER 1960

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PLEASE HELP SPASTICS

That Others May Learn

LAST April, the European Productivity Agency of OEEC, sent a mission of experts from ten countries to study over three months integrated data processing in the USA, and in this issue, Brian Maynard, a partner of Cooper Brothers, the chartered accountants, who led this mission, contributes an article on what the experts saw and learnt. Certainly, it seems always safe to bet, with study groups of this kind, that they will bring back reports that say or imply 'things are better done over there.' Mr Maynard reports for example, that more than 350 computers have been ordered or installed in the USA by government departments for routine data processing work of an administrative nature, and this naturally begs the question 'how does this compare with government activity in Britain?'

Of course, no one supposes that the mission discovered no skeletons in American cupboards. They did. Mr Maynard made this clear quite recently at a press conference held to launch the mission's official report (which is published by OEEC). However, a report of this kind does not set out to be snide, but to highlight achievements that others may learn.

Others can certainly learn from section seven of the report. Facilities for post-graduate management training in the USA mean that many thousands of engineering, science and arts graduates can attend courses in business administration. And management educationalists have not been slow to see the importance of electronic data processing. In fact there are over 100 computers in American universities. Consequently, the majority of students at leading engineering and business schools gain direct knowledge of computers.

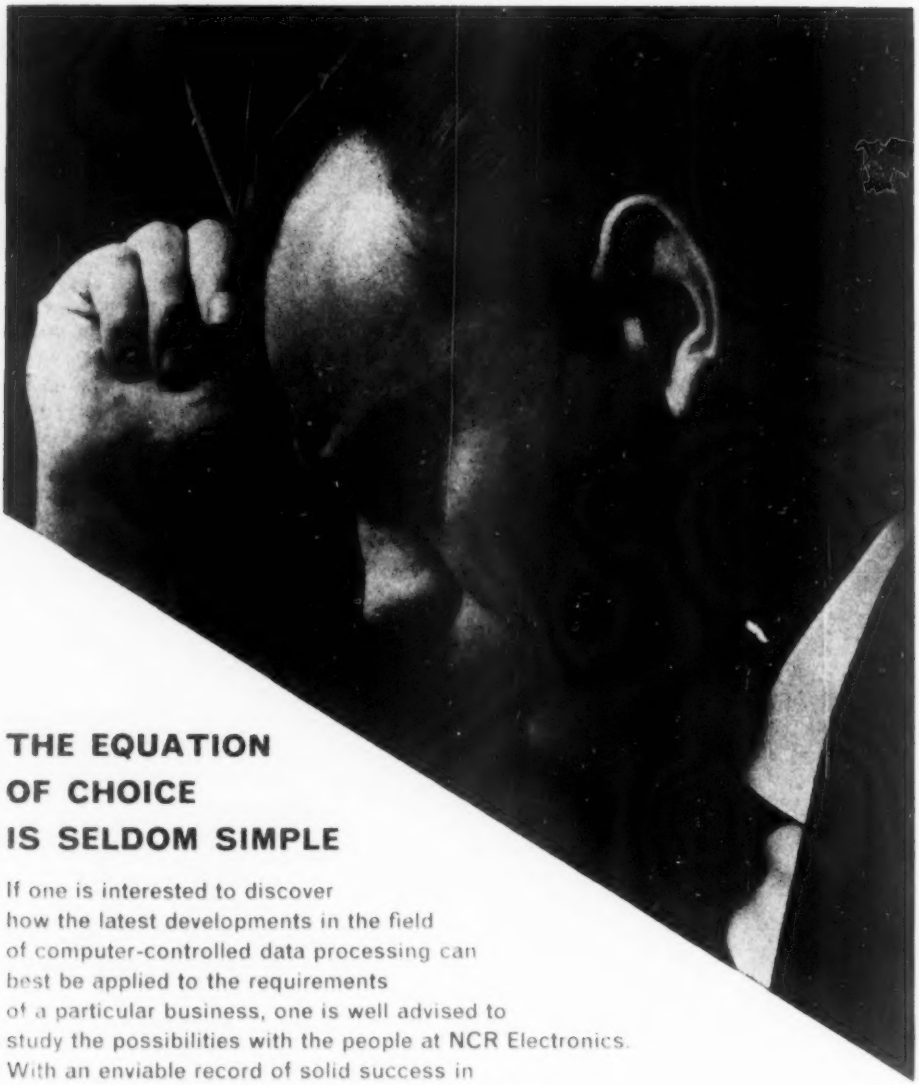
Computers on the campuses are changing management training syllabuses (computer-oriented courses are being increasingly devised) and encouraging the use of quantitative methods in the management sciences—particularly operational research and industrial dynamic techniques.

Each year, a steady stream of several thousand graduates with knowledge of computer techniques is pouring out of American colleges: in five years' time, the 1960 alumni will have reached middle management levels when the impact of a completely new outlook may be felt.

Management education—should it need to be said?—does not breed business geniuses: in the USA it provides a body of future managers with an all-round appreciation of business activity and insight into the interdependence of the various functions of a business; new management techniques, such as those of automatic data processing and operational research, become quickly absorbed into business school curricula, so that the graduate learns what they achieve as part of the package of experience offered.

In Britain, where we do not have one business college, where management education is provided by a haphazard patch quilt that comprises management consultants, a few technical colleges, individual companies and professional organisations, and the odd university diploma course, there are no comparable opportunities for graduates —or if there are, they are unknown. The three ostriches—private industry, government and the universities—push smug little heads into the sand and pretend that British middle management in the 1970s will be equal in training, understanding and ability to their American counterpart—without the fuss of college capers.

Lord Chandos, during the annual meeting of the Institute of Directors held last October, referred to a one-year course in general theory and administration of business run by the London School of Economics. 'The students attending this course,' he said, 'have been almost entirely from overseas, which I think is a reflection on the business community in the United Kingdom.' It certainly is.



THE EQUATION OF CHOICE IS SELDOM SIMPLE

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how the latest developments in the field
of computer-controlled data processing can
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News of the month at a glance

Big-time computing

To simulate the economy

The most significant statement that came with the news that CEIR Inc, the American research consultancy firm, had ordered an IBM Stretch-type computer was one made by Herbert Robinson, CEIR's president: 'It will be possible to give serious thought to simulating the entire United States economy to determine the total effects and implications of alternative economic policies.'

The hint of intent is at first staggering, but Andrew Booth, writing in this journal in April 1959, was already predicting this sort of possibility when he wrote:

> 'On the national and international scale it seems that towards the end of the next 10-year period computing machines will come into full-scale operation on problems of government. At present there is a particularly interesting example of the way in which a machine would make a far greater and more sensible use of existing facilities. This occurs in the field of fiscal planning, where a cursory inspection of economic records reveals that our economy is in a state of exponentially increasing oscillation. On the one hand stringent measures of economy, such as raising the bank rate and restriction of hire purchase facilities, are imposed. These lead after quite a short time-lag to a state of depression in which unemployment is produced.
>
> 'Unemployment is anathema to modern politicians committed to the idea of the "welfare state". In panic, therefore, they release all restrictions, and this in turn causes an almost immediate inflation because of under-production and over-consumption. The inflation in turn gives rise to international complications and to terror in the hearts of the rulers. Measures of compensation are applied, which result in a recommencement of the cycle just described. A computing machine would at least take into account the question of dampening out the oscillations in the cycle. It could not be accused of partisanship . . . and it would be hoped that at least the more intelligent members of the community would accept its rulings.'

With a computer of Stretch's capacity on the strength, CEIR — whether or not they evolve programs to simulate the US economy — will certainly be in a position to tackle problems previously too complex to solve in reasonable time on other computers.

How to instal

Emidec for Sydney

Norman Hill, EMI's chief computer executive, was packing his bags recently to start a five-week tour of Australia. Though Canberra, Melbourne and Adelaide were on his itinerary, main purpose of the trip was to give advice on the arrangements necessary for the installation of an Emidec 1100 computer which is to go into EMI's Sydney office.

Hill, who has visited Europe and the USA for EMI, previously visited Australia to study at first hand computer problems and applications.

EMI are not alone in 'prospecting' down under: Leo Computers, Elliott's and Ferranti have also done some spade work there.

Programs written

Other people's homework

A new venture that aims to fill the gap that the shortage of trained programmers produces is Vaughan Programming Services. Head of the service is Mrs A N St Johnston (nee Vaughan), a former Elliott senior programmer, who says her company will be able to write programs for *all* computers.

Vaughan Services, who will undertake scientific as well as data processing programming, have no fixed charges, but quote for each job after estimating the work involved—an aspect of this is that Vaughan Services can quote for part of a job when this is desired.

The company operate from Brickendon, Herts.

Power for research

Most complex problems to solve

Ordered recently by the Agricultural Research Council and due to be delivered in the autumn of 1962 is an Orion computer.

It will be installed at the Council's Rothamsted Experimental

Station and will be used for statistical analysis work on problems concerning crops and their cultivation, animal feeding and stock breeding.

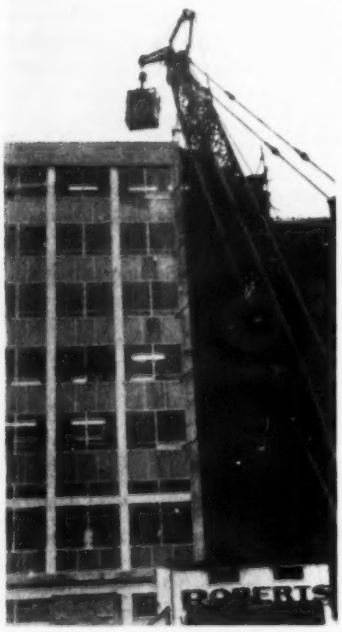
During the past six years the station's statistics department has used an Elliott 401 computer on varied statistical work for biologists and agriculturists both in this country and the Commonwealth. This has given the station experience of computer work and a clear indication of the contribution a computer can make to research. Added to the increase in volume of work for a computer, the complexity of problems to be handled now make the installation of a larger and more powerful machine expedient.

Ready now

Have computer—will sell

About £150,000 worth of Univac computing equipment was recently delivered to Remington House. Remington Rand say that the equipment will be used to deal with the company's own accounting work—at first head office work, but later for factory accounting and stock control work—but also as a 'practical customer support operation.'

The system will form the kernel of an attack of the British market. Remington Rand have been building up marketing training facilities and plan to hold a series of training courses next year.



UNIVAC AND CRANE
The kernel of an attack

Founder members

. . . for data processing teams

Last month British Olivetti advertised in the national press (and elsewhere) for two founder members to form a data processing sales team. The team will sell Olivetti accounting machines with built-in tape perforators and electronic reader-converters.

Olivetti's Audit range of accounting machines was exhibited at the last Business Efficiency Exhibition, but the paper tape equipment has not yet been seen in Britain. It was, however, demonstrated at the Paris office equipment fair, SICOB. The tape produced by the accounting machine is six-channel square hole tape, and the reader-converter transcribes these tapes into punched cards. It is not yet clear whether Olivetti paper tapes can be used without the reader-converter—*ie*, whether they would be compatible with other tape readers.

Olivetti in Italy have developed a computer named Ellea and sold two machines, but it is not yet clear whether the machine will be introduced into Britain.

Peebles get it

First computer in Edinburgh

After waiting 16 months Bruce Peebles, the Edinburgh instrument firm, have taken delivery of a Pegasus computer. Purchased for fundamental research calculations, Peebles may also undertake on this machine production and stock control as well as sales analysis.

COVERS OFF
. . . and Professor Humphrey-Davis (left) and Peebles executives inspect

The company intend to make their machine available to outside organisations, which may be one of the reasons that have prompted Edinburgh's Heriot-Watt College to organise a number of courses on computer appreciation and how to program Pegasus.

Me too

What's good for US banks

So it is to be the E-13B. The decision of the electronics sub-committee of the London Clearing Banks to adopt the American magnetic machine code for electronic cheque sorting will disappoint more than the two other promoters of competing codes.

The E-13B, which lacks alphabetical characters, looked at one time a doubtful finisher in the MICR race. It seems the decisive factor was the availability of a complete range of American equipment based on the American code. The committee, announcing their decision, reasoned (speciously) that 'substantial advantages could flow from the employment of a machine language common to the two English-speaking communities,' though the two countries have totally different currencies, and seem unlikely to interchange cheques.

Change of machine

More speed for UKAEA

July last year the United Kingdom Atomic Energy Authority

began operating an IBM 709 computer, and already the Authority has ditched this machine in favour of an IBM 7090—a machine of the same specification as the 709 but between four and six times faster in operation.

The 7090 was delivered to the UKAEA on 19 September, passed its tests on 5 October and was handed over a week later.

New Adrema chief

Switch from Solartron

48-year-old Eric Jones turned in his job as group commercial director of the Solartron Electronic Group Ltd recently to become managing director of Adrema (Holdings) Ltd and European vice-president of the Farrington Manufacturing Co (USA), who recently acquired a holding interest in Adrema.

Jones who joined Solartron in 1953 created a sales organisation which, under his tutelage, in seven years built up the turnover from a modest of £100,000 to £3½ million a year.

Adrema manufacture the Bradma line of addressing, listing and plate embossing machines; mailing equipment; and storage systems. Recently the company brought out an electronic calculator that works with addressing plates, and exhibited on their stand at the October Business Efficiency Exhibition an optical scanner developed by the Intelligent Machine Division of Farrington. The appointment underlies Farrington's determination to enter the British market.

Jones succeeds Robert Cranston as Adrema's managing director.

Future service

New contender in time-hire

A recent issue of *Electronics Weekly* reported that a new company, Computer Time Hire Ltd, had been registered. The company were said to be negotiating for a computer 'expected to cost in the region of £1 million pounds.'

Computer Time Hire has a share capital of £100 and two directors, Miss T S Blane and Mr R H Williams, and at present has the same address as Computer Consultants Ltd, which Mr Williams founded.

Mr President

OABETA elects

New president for the Office Appliance and Business Equipment Trades Association (OABETA) is Ted Lewis who succeeds W R Hart of National Cash.

Lewis is general sales manager of Block and Anderson as well as being a member of the company's management committee.

Hart, the outgoing president, reporting on activities during his year of office, forecast improved export figures for 1960 for the industry; substantial relief from purchase tax had been obtained for members' products, but the Association would continue to press that it was undesirable to tax items which other industries must employ to operate economically.

250 Dictators

. . . in one firm

The significant fact behind the announcement that South of Scotland Electricity Board is to install a centralised dictation system is that when in service it will cater for 250 executives, but in the three typing pools which will transcribe what the dictators have said there will be a total of only 30 audio-typists. This means that for the dictation of every eight executives one audio-typist suffices.

The equipment, made by Aga Dictating, uses special telephones which—by operating buttons—allow complete and remote control of a dictating machine in the audio-typing offices.

Mr Chairman

ICT's head

Following on the death of Sir Cecil Weir, who was chairman of International Computers and Tabulators, H V Stammers—formerly deputy chairman — has been appointed acting chairman.

Continued on page 9

ADREMA'S JONES
A new scanner to sell?

OABETA'S LEWIS
to lobby against tax?

ICT'S STAMMERS
acting only

creed

now offer the widest range of paper tape output punches for data processing with speeds from 25 to 300 characters per second.

in addition to the well-known

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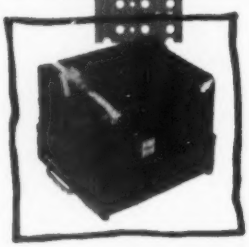
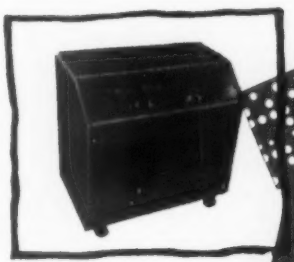
punches tapes, singly or two at a time, in 5-, 6- or 7-track coding, at **25** characters per second.



and the dynamic super-speed

model 3000 TAPE PUNCH

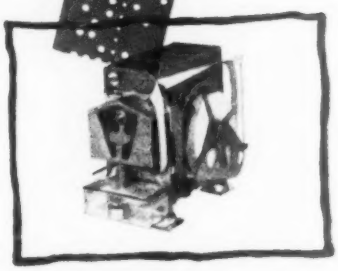
records computer output in 5-, 6-, 7- or 8-track tape at speeds up to **300** characters per second.



they can now supply for medium speed applications the new

model BRPE 110 TELETYPE PUNCH

punches 5-, 6-, 7- or 8-track tape at **110** characters per second. A 63.3 characters per second model can also be supplied.



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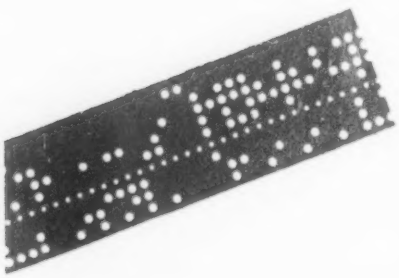

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Shy of gown?

Opportunities in Universities

The computer companies with offices in London have mostly gone into the computer time-hire business, whenever they have had a suitable machine, and a fair amount of work is done at these centres and this is increasing. Outside London, with three notable exceptions, the companies have not bothered to establish computer centres, and one would have thought that those universities with computers would have had a rôle to play—to offer provincial companies computing and data processing facilities. Yet according to a survey carried out by AUTOMATIC DATA PROCESSING this has not yet happened. Whether firms are shy of approaching academic bodies, or are just unaware of the facilities that exist is not clear. Yet universities could certainly do more service work for companies: out of five universities and one technical college considered that already do some service work for outside organisations, all but one have some surplus capacity on their machines, while the remaining one could meet requests by extending working hours. (All five universities and the technical college run programming courses for their machines, and while they do not offer full programming services for would-be customers, most of them are prepared to offer advice, and are prepared to actually run their machines with customers' programs. The table above gives the cost of hiring time on the various university machines.

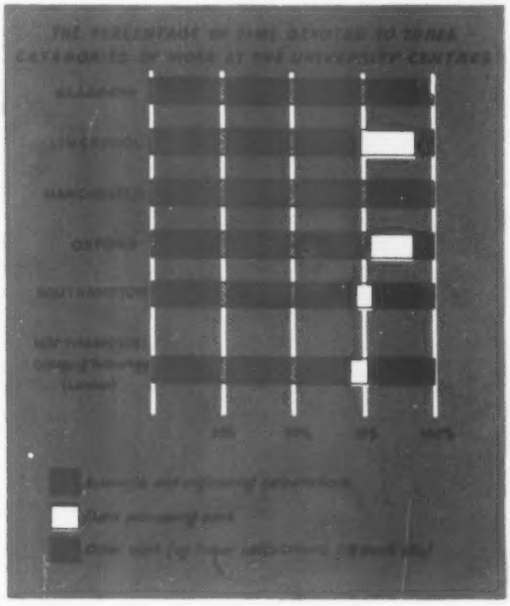
University	Machine	Charge per hour	No. of Customers
Glasgow	Deuce I	£30	10–20
Liverpool	Deuce II	£30	8
Manchester	Mercury	£75	18*
Oxford	Mercury	£75†	15
Southampton	Pegasus	—	6
Northampton College of Technology	Pegasus	£40†	30

† This is a maximum figure; varying rates may be charged depending on the amount of time hired in a year.

* Also six university customers charged only £3 15s. 0d. per machine hour.

An approximate breakdown of the kind of work done for outside organisations shows that this falls mainly in the category of 'scientific and engineering calculations'; for example, all or almost all the service work done at Glasgow, Manchester and Southampton is in this category. At Liverpool and Oxford some data processing work has been done but this represents no more than 20 and 15 percent respectively of the work done at these centres.

One must expect that the university centres will always have some bias towards scientific and engineering computer work, but more data processing work could be tackled; the universities themselves, who will be wanting to experiment with the faster, and more costly, solid-state machines will welcome in the long run regular commercial customers who will bring a steady income to offset the purchase price of new machines.



News in brief

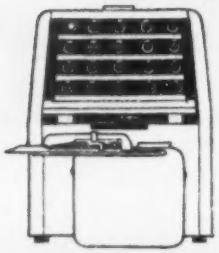
. . . H M Customs and Excise have appointed a committee to look into the possibilities of computer applications within the department.

. . . Tube Investments are to install an IBM 700 series computer. The company previously rented an IBM 650 merely to gain 'know-how.'

. . . A Solartron ERA is not, after all, to be utilised in the Boots Organisation. ERAs have been ordered by DER Ltd and Burtons' the tailors, and there is a rumour of a big new order pending for a national sporting organisation.

. . . AEI have produced a short film on AEI 1010—an explanatory-cum-sales promotion documentary.

the day they threw the pencils away at Northrop



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BUSINESS MACHINES

The Northrop Corporation's Norair Division had a common and very costly bottleneck: internal paperwork. The solution? *Automated data preparation* by means of a Friden Collectadata System. Located in key plant locations, Collectadata transmitters report virtually all internal transactions - about 45,000 daily - to central Collectadata receivers which record them into punched paper tape. At day's end, the Collectadata tapes are fed into Norair's electronic computer for high speed data processing. Northrop estimates that this *completely automated* system will eliminate *two truck-loads of paperwork annually.* How much could Collectadata save you? Call Bulmers, and find out. Bulmers (Calculators) Limited, 47-51 Worship Street, London, E.C.2. MONarch 9791.

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Thirdly, Ferranti have trained more than 1,000 programmers, who are helped by a half-million pounds programme library and the thoroughly expert Ferranti after-sales service.

Many businesses with intermittent needs make use of the Ferranti Computer Centre, where you can always see a computer at work. Write or telephone for an appointment: **Ferranti Ltd., London Computer Centre: 68/71 Newman Street, London, W.1. Museum 5040, and at 21 Portland Place, London, W.1. Works: West Gorton, Manchester 12. East 1301.**

Ferranti

Here are some of the important companies who have installed Ferranti computer systems for their contribution to business efficiency:

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Shell International Petroleum Company Limited

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What can we learn from

RECENT development in equipment and methods have made it both possible and economic to achieve much higher degrees of integration in data processing procedures. The rate of progress in exploiting the new opportunities has, of course, differed considerably between countries, but it has for some time been evident that a study of experience in the United States would be of interest to Europe.

It was for this reason that the OEEC sponsored the recent mission to the United States which I had the privilege of leading. Our report*, which has recently been published, has been written with the primary object of creating a greater awareness among management of the advantages of an appropriate degree of integration whenever data processing activities are being reviewed—especially where the introduction of a computer is being considered.

Here I will confine myself to describing, as far as possible in the mission's own words, achievements and prospects in the United States; some of the computer techniques used by Americans; how service centres are used; management education; and the role which government has played in encouraging research and development in the EDP field.

CONCEPT OF INTEGRATION

The best definition of integrated data processing (IDP) that we could produce was 'the development of the most streamlined and automatic flow of data that is practicable throughout an organisation.' Integrating data processing activities necessitates an organisation-wide approach and the recognition of the inter-relationship of all administrative activities, so that data processing is planned with the requirements of all the ultimate users in mind. A high degree of integration involves the initial recording of all the data required in connection with a transaction or occurrence in an automatically readable form, so that it can be subsequently processed in such a way as to minimise both the need for human intervention and the repetition of operations on the same data.

The concept of IDP is, of course, not new. No efficient over-all plan for data processing activities can be designed, whatever the methods used, without considering how far better control information can be provided or economies made by integrating associated procedures. In its simplest state, integration exists where a form or set of forms is so designed that, with the use of carbon paper, a number of documents required for different purposes can be completed simultaneously by hand.

The development of accounting machines opened up much wider horizons—a considerable degree of integration is, for example, possible with punched cards, which can be re-sorted and used for various associated procedures. The introduction of computers for business data processing offers even greater possibilities. It was therefore electronic data processing that the mission studied.

ACHIEVEMENTS IN THE USA

Although it is less than ten years since computers were first used for business data processing, considerable progress has already been achieved. Further advances seem to be assured by the large sums being expended by both manufacturers and users on developing new equipment and procedures.

* Integrated Data Processing and Computers (HMSO) 10s 6d.

the United States?

A Mission of European experts spent three months visiting data processing installations in the USA under the auspices of European Productivity Agency of OEEC. Brian Maynard, who led this mission, highlights some of its findings.

Outstanding attempts are currently being made by some of the larger American organisations to realise extensive schemes for integrating their data processing procedures. One of the best examples we visited was a manufacturing concern which was co-ordinating its procedures to form one integrated flow from the receipt of the customer's order to the costing and accounting after the completion of production. Such areas as payroll or invoice preparation, instead of being regarded separately as major ends in themselves, had been considered in proper perspective, *ie.* in relation to the many other important requirements.

Such examples were both challenging and encouraging, but the extent to which the possibilities of integration have so far been generally exploited was, if anything, slightly disappointing. However, it is still early days. As the success of the earlier pioneering operations becomes apparent, it seems likely that other organisations will soon follow their lead.

In the meantime, many of the more progressive organisations are now working on integration schemes limited to such areas as:

(1) The sales area—including the processing of enquiries, quotations, sales orders, sales invoicing, manufacturing and despatch documents, finished goods stock, credit control and accounts receivable and sales reporting statistics;

(2) The production control area—including the processing of product plans, stocks at all stages in manufacture, product and manufacturing methods, payroll, progress and costs;

(3) The purchasing area—including the processing of raw material stocks, purchase requisitions, purchase orders, overdue deliveries, goods receipts and accounts payable.

These applications have often been most successful where large volumes of data are involved, as have certain specialised applications such as insurance work, public utility billing, banking and some government installations.

INTER-COMPANY INTEGRATION

Much of the routine data processing of most organisations is concerned with data which come from outside sources. Too little attention has, however, so far been given to the opportunities for transmitting data in a form which can be prepared economically by the originator as part of its normal procedure and is, at the same time, a convenient input medium for the receiving organisation. The growing use of computers and punched card systems which record information in media suitable for exchange between organisations makes this an issue of some importance.

Between industrial and commercial organisations the most obvious possibilities for integration lie in the purchasing and sales fields and where several firms jointly provide a service—for example, banks, railway and airline companies. One interesting development in the United States is an integrated scheme for the supply of aircraft spares between a manufacturer and the different user airlines. This involves the use of common specifications and the exchange of punched cards and magnetic tape for provisioning and purchasing. This lead will probably be followed by other concerns in this industry and should also have a wide impact in other fields.

There are encouraging examples of the exchange

of data on magnetic tape between industry and Government. Summaries of payroll information are sent by certain corporations to the Social Security Administration for further processing; and there have been some similar exchanges between corporations and the Department of Defense. Other possibilities under consideration include taxation returns and the exchange of data between suppliers of stores and Government.

MANAGEMENT INFORMATION

One of the most valuable fields in which computer techniques are being developed is producing faster and better information for management, particularly through the use of exception reporting techniques. Many of the organisations we visited stressed the improvement in the quality of the information provided to management through the use of computers—the earlier availability of reports in itself was often a material improvement.

With higher degrees of integration, it will be feasible to combine different flows of inter-related data within the EDP system and thus provide management information based on a wider range of inter-dependent factors which affect decisions. *These possibilities form part of current thinking in the United States, though admittedly we saw little evidence of practical attempts to improve reporting in this way.*

Often improved knowledge or better control resulting from the computer's ability to scan the whole contents of large files of data at great speed led to important savings or increases in efficiency —for example, in production control, where frequent reviews can be made of such items as orders scheduled for production, and in stock control applications.

Another area where computers have been particularly valuable is in sales reporting. Several concerns said that reports on the deviations from sales forecasts had greatly helped in directing sales tactics.

EFFECTS ON ORGANISATION

In some cases computers themselves are taking over various categories of routine decisions and making them more rapidly and reliably than before. This is, of course, only possible when decisions are based on factors which can be defined and quantified. Such categories include the control of allocations and re-ordering of stocks, parts scheduling, the preparation of sales quotations and delivery promises, and the re-allocation of stocks between agents or shops to maintain supplies of fast-selling lines.

As routine decisions of this kind are taken over, there must obviously be changes in the duties of the managers concerned. For example, a factory manager may be able to spend on more constructive planning the time previously taken up with emergency decisions to keep work flowing through the factory.

Brian Maynard, who was leader of the 25-strong EPA Mission which visited the USA during April, May and June this year, is a partner in a firm of chartered accountants, and was nominated to the Mission by the British Institute of Management. (OEEC published the Mission's report at the end of November.)

In most undertakings data processing organisation tends to be split up into sections. These reflect the purpose for which the data are required, although their activities are often related primarily to data which are also used in other departments. It seemed to be generally accepted that the effect of computers on such organisation structures will ultimately be fundamental and far-reaching, because the increased degree of integration which they offer will cut across many traditional inter-departmental boundaries.

OPERATIONAL RESEARCH

Particularly impressive were the results being achieved with operational research techniques in industry and commerce. The growing use of these techniques owes much to the development of computers for two main reasons. First, because in many cases the use of operational research is dependent upon the availability of high-speed computers. Secondly, because the inclusion in the computer program of formulae arrived at by operational research techniques can produce far more intelligent solutions to fairly complex problems than would otherwise be possible.

Some operational research problems could not be solved at all without a computer. Where the technique of simulation is used, for instance, a computer has the advantage that, once the relationships between various factors in a business operation have been defined mathematically, many different situations can be examined to decide on

the best course of action. One example was a simulated model of a large machine shop. Mathematical formulae representing such factors as the probability of obtaining new work, the probable mix of machining time, the probabilities of breakdowns and other delays and the time required to move parts from one machine to the next, were programmed into the computer. The model can be used to test the effect of different methods of loading the shop in order to get nearer the optimum procedure.

There were some interesting cases of the combined use of statistical methods and computers to find ways of reducing the volume of data processing. For example, it can sometimes be established that procedures based on short-cut methods like sampling, can produce solutions to such problems as inter-line accounting for airlines and railways revenue accounting that are not materially inferior to those produced by much more elaborate methods involving greater loads of data processing work.

The value of these techniques must inevitably depend upon the quality of the assumptions, and the accuracy of the available data. There is, however, no doubt that operational research is being increasingly used in United States industry. Some computer manufacturers have been using operational research teams to develop 'packaged' systems of inventory and production control.

INTEREST AND DIRECTION

No major change in methods of data processing can be introduced without some difficulty and anxiety. In this field, United States experience is remarkably similar to our own.

The importance of firm management direction and interest to the successful installation and operation of an EDP system was emphasised repeatedly. Responsibility should be placed at a high level in the organisation. Indeed, in view of the organisational issues involved, this is essential if a high degree of integration is to be attained. The most successful installations seen by the mission owed much to management support.

There is a growing realisation of the time and effort required to plan and install any EDP routine. In the past, difficulties have often been caused or aggravated because management has pressed for results earlier than was reasonable. This attitude has resulted partly from failure to appreciate the complexity of the problems; but sometimes also from reluctance to allow any expenditure of money or time on research and development which did not seem to contribute directly to profits.

We saw, for example, existing punched card procedures being transferred to a computer without any real assessment of the new possibilities. A more realistic approach can be expected as the potential of EDP becomes more widely realised.

The first action for top management is to authorise the initial study. The main purpose of this is to produce a report which will enable management to assess the economic and other advantages of introducing EDP and to weigh these against the effort and risks involved. A pattern for this stage is now clearly established and does not differ greatly between the United States and Europe.

Until the study has been completed, management cannot know whether it will prove desirable to go ahead with the introduction of EDP and will not, therefore, wish to build up a large team of specialist staff or incur other long-term commitments. More organisations than in Europe have therefore used outside consultants to help their own staff in preparing the initial study. As in Europe, few of the smaller organisations have a specialist methods team and even where one exists its members are unlikely at the start to have much practical knowledge of EDP. In such cases, consultants have been used both for preparing the initial study and later, while a team of the right calibre was being built up.

COMPUTER SERVICE CENTRES

The use of service centres is growing rapidly in the United States. By the end of 1960 there will be more than 20 large computer systems and a larger number of medium-sized computers operating in this way. Though most of the centres are run by the computer manufacturers, either as separate divisions or through subsidiary companies set up for this purpose, others are operated by independent corporations.

The type of equipment used varies considerably between centres. Computer manufacturers normally install a fairly complete range of their equipment. Many other centres have large computers with a wide range of ancillary equipment. The speed and flexibility at their disposal not only allows them to undertake a great variety of complex work, but enables them to carry out relatively simple assignments at a lower unit cost than would be possible with a smaller, cheaper computer. Those centres already operating as punched card bureaux have often begun by installing a small computer to take over some of the more complex work previously done on punched card equipment.

Most of the work carried out by computer centres so far has been for such purposes as statistical analysis, operational research and engineering. Such applications are attractive to users because they offer considerable savings and present no administrative problems, since they are inde-

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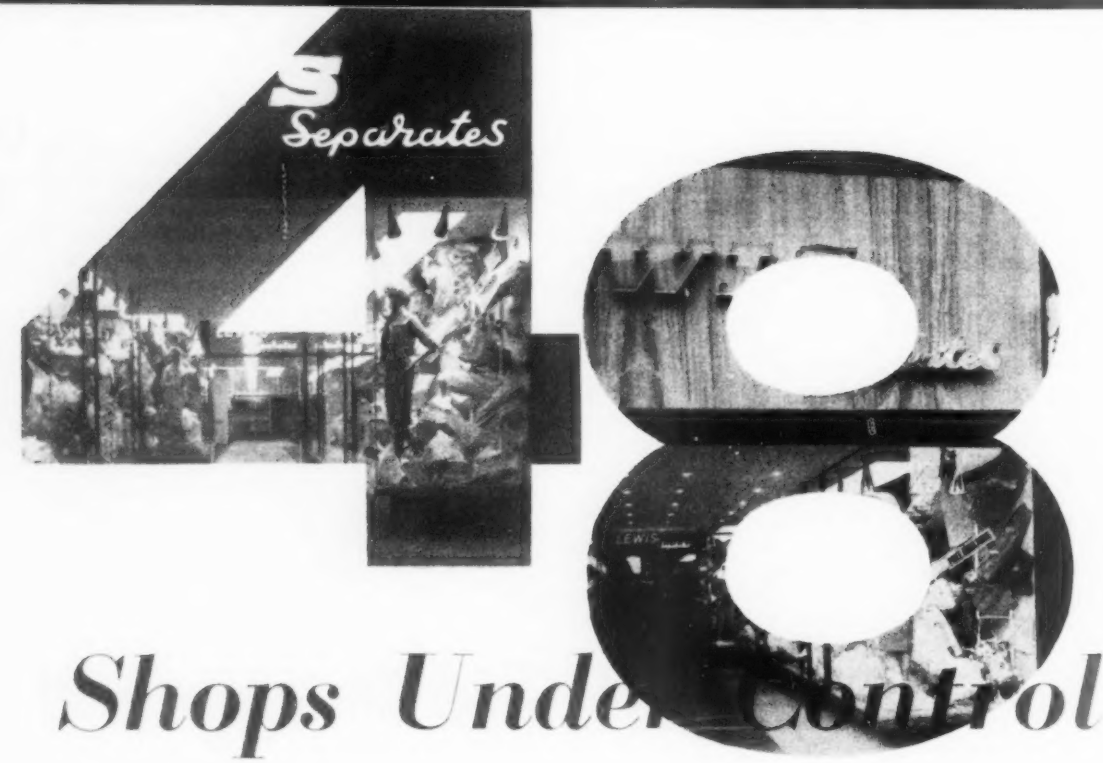


Shops Under Control

Lewis Separates began as a three-shop company seven years ago—now they retail women's fashion garments through a chain of 48 shops, have a turnover that runs into seven figures and are concerned about the problems of control

IN February, 1954, two brothers, Bernard and Geoffrey Lewis, decided they would set up a joint buying organisation to supply the three shops they owned (two were owned by Bernard Lewis and one by Geoffrey Lewis), and Lewis Separates began its life. Two other brothers—David Lewis, FCA, and Godfrey Lewis, were invited to join the company to develop the nucleus of three shops into a chain of stores.

Since that time the growth of the chain has been dramatic: by the end of 1954, the company owned five shops, two years later the chain comprised 17 shops, and by the end of 1958 there were 24—now there are exactly double that number located throughout the country, from Glasgow to Brighton.

From the start, Lewis Separates gave a good deal of thought to methods for stock recording, and this is one of the factors, David Lewis claims, that enabled the company to expand quickly, though he admits the chain has 'grown out' of more than one system.

Lewis Separates is a fashion business: the shops sell popular lines of ladies' garments—stockings, skirts, blouses, etc.—and in such a business, merchandising decisions (what to buy for the shops to sell), are of considerable importance: over-buying results in dead stocks, under-buying in lost sales. So ways and means of watching how the various lines sell—particularly new lines—are important.

In addition, the company now has its own manufacturing arm which supplies a proportion of the lines stocked in the shops, so sales information is needed not only to guide buyers, but also to tell the making-up unit when to switch production, for example, from making blouses to skirts.

Recently, Lewis Separates installed a system which presents management early each week with a complete record of all the items sold through-

out the 48 shops up to closing time on the previous Saturday. It produces records of sales values and stock positions for each category of garments at each branch.

The system, which has only been operating a few weeks, makes use of Kimball tags and conventional punched cards. A Kimball tag is attached to every garment to be sold through the shops, and this records—in a code comprising miniature punched holes*—the style, size, colour and price of each garment. When a garment is sold in one of the shops, the tag is detached; at the end of each day, the branches mail their collection of Kimball tags to Lewis Separates' headquarters in Olympia, London.

At head office the tags are fed in batches to a special Kimball reader which interprets the information on the tags and transfers it to a punched card reproducer—the output from the reproducer being conventional punched cards. From this point, after appropriate sorting and collating, the cards can be tabulated to provide complete analyses of branch sales giving details of garment, colour, size and style.

Each branch in the Lewis Separates' chain, stocks approximately 500 different lines—and from a stock control point of view, to allow for varieties in sizes and colour, this figure should be multiplied between three and five times; this, then, gives some idea of the size of analysis task Lewis Separates have undertaken. The company were keen to be able to break down sales made by branches and categories of garment, in order to gauge accurately what sells well or badly; in addition, the company work at present on the normal chain store principle that what will sell in Brighton will also sell in Glasgow, but now, with up-to-date information on what is selling at each branch, they will be able to vary branch allocations realistically.

The new system will give Lewis Separates not only information on sales, but a stock controlling system that will indicate not only what quantities of garments are in the sales pipeline, but also the value of stocks.

When issues to branches are made, goods delivery notes will be sent to the punched card room. Branch invoices will be prepared on a tabulator, and a summary card will be prepared for each line, giving the total value of each delivery at the selling price. Summary cards will then be sorted by branches and filed. When Kimball tags, which indicate the price, come back from the branches and their information is transferred to punched cards, it will be possible for each branch to compare the money value of sales with the money value of stocks issued, and arrive at a money value of stocks held. Price reductions, transfers from branch to branch, and returns to the warehouse in London are allowed for in this system.

This particular procedure is not yet in operation, as Lewis Separates have still to receive most of their punched card equipment. This is being supplied by De La Rue Bull Machines and in the interim Lewis Separates are using equipment in De La Rue Bull's demonstration centre in Southampton Row, London, for branch sales analyses.

* An article on Kimball tags appeared in the October, 1959, issue of AUTOMATIC DATA PROCESSING.

A high volume of transactions in popular-priced garments is the basis of Lewis Separates business

David Lewis took the precaution of visiting Kimball installations in the USA before deciding to put Lewis Separates on to Kimball tags

PUTTING ON TAGS

One problem about using Kimball tags in retailing is that while the tags do provide accurate information about transactions, normally every article sold by a retailer has first to be tagged, and for retailers who stock thousands of quite small items — for example, such items as lipstic's and boxes of aspirin — this would be an impossible task. However, for Lewis Separates, putting Kimball tags on to garments has presented no problems. Previously, all garments had to be ticketed with the price, and two American machines which automatically printed the price, guillotined the ticket from a roll of paper and pinned it to the garment, were used. At present, the company is trying to adopt one of these machines to work with Kimball tags. However, Lewis Separates have been able to persuade a number of their suppliers to put on tags prior to delivering garments to the warehouse—so that the business of providing each garment with a tag does not delay despatching.

Kimball systems — marketed in Britain by B U Supplies and Machinery—were first developed in the USA wheremany more installations have been put in than in Britain. So David Lewis, who was responsible for Lewis Separates' clerical procedures, visited the USA to see Kimball systems at work. There he found chains that had long operated with punched card equipment, but who only fairly recently had adopted Kimball tags. The advantages pointed out to him was that whereas previously the chains had employed teams of girls to punch cards to record sales information, the adoption of Kimball tags cut down considerably the amount of manual punching required.

Lewis Separates will certainly not do a great deal of manual punching, and their card installation will in fact include only one punch and one verifier machine.

COSTS

Justification for installing electro-mechanical (and even electronic) systems usually takes one of two forms: either the new system will bring lower operating costs or it will provide better results. In Lewis Separates' case, the company were prepared to spend more running a mechanical set-up than on the old manual system. This was because the combined Kimball and punched card system would bring greater reliability and provide more statistics and bring out the required results much more quickly than could have been done before. They estimate that the cost of operating the system is nominal in relation to the company's £2 million turnover, particularly as the information obtained is critical to the business.

The Editor, the Advertisement Manager and the staff of AUTOMATIC DATA PROCESSING wish all their readers and advertisers happiness and prosperity in the New Year

Ronald Wilcox

Herbert Grange go for Quicker Invoicing Quicker Analyses

Providing buying and office services to three companies gave Herbert Grange the task of getting invoices out quickly, but additionally the problem of working out royalty payments. A system that involves edge-punched cards, paper tape and conventional punched cards brought a solution

The advantages that can be obtained from mechanised data processing by a comparatively small organisation are highlighted by the experience of Herbert Grange and Co Ltd, of Shipston-on-Stour, Warwickshire. With three associate companies, C A Norgren Ltd, Sundstrand Sanders Ltd and Shipston Engineering Co Ltd, Herbert Grange manufacture and sell in Britain compressed air equipment such as lubricators, regulators and filters for air-lines, sanding machines used in the motor-car and furniture industries and in motor bodywork repairs by garages.

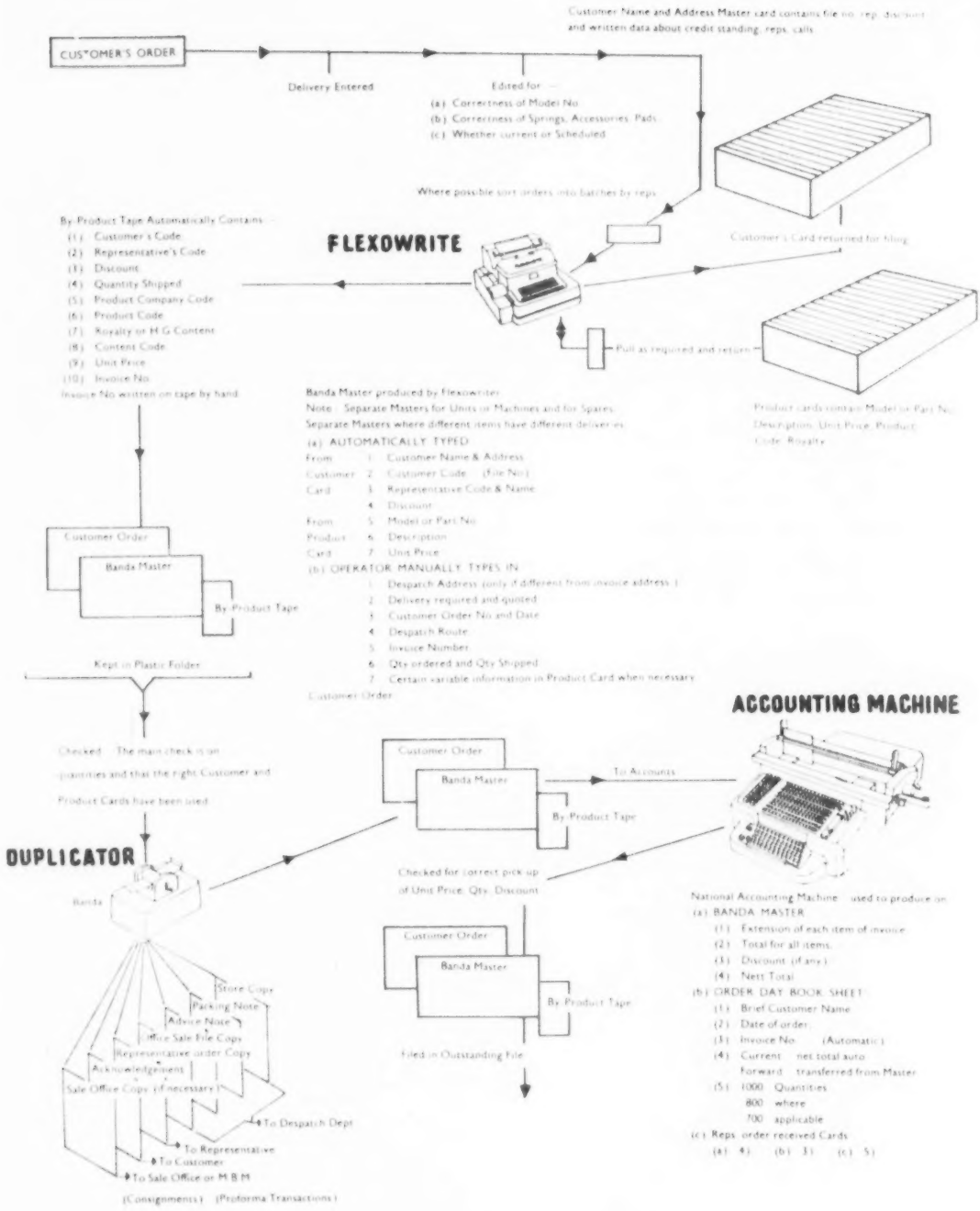
First, to put the organisation and its problems into perspective, a little history is necessary. The companies were founded in their present form by the late Mr P F Symons. Originally, the sanding machines were imported from America, and, as each machine requires a filter, pressure regulator and lubricator, he at once saw the potentialities of also selling these three items in this country. At that time these items were of American origin, and at first they were also imported.

They are all now made at Shipston-on-Stour, the sanders under licence from the Sundstrand Corporation, of America, and the other items under licence from the C A Norgren Company, of America. Hence, the British companies of similar name are selling companies, while Shipston Engineering is the manufacturing company, and Herbert Grange provide, among other things, buying and office services.

These arrangements of manufacturing under licence present an extra clerical problem on top of the normal necessity for dealing swiftly with possible sales. Every invoice has to be analysed for its royalty content so that royalties can be totalled at intervals. Prior to mechanisation this was a tedious procedure, taking much time and trying to the patience.

For this reason alone the data processing system adopted by Herbert Grange and Company 12 months' ago has been justified, but it has brought other benefits. It has resulted in economies in less checking being required in preparing invoices and works order documents, there is increased accuracy, and it has provided a quick and ready means of assembling information for weekly and monthly analyses for various purposes.

The system is based on a Flexowriter Programmatic machine. This is an electric typewriter linked with a tape punch and it also has a reading head which can read information from a paper tape or perforated card (an edge-punched card). It can be used as a normal


Customer Name and Address Master card contains file no. rep. discount and written data about credit standing, reps. calls
CUSTOMER'S ORDER
Delivery Entered
Edited for —
(a) Correctness of Model No.
(b) Correctness of Springs, Accessories, Pads
(c) Whether current or Scheduled
Where possible sort orders into batches by reps.
By-Product Tape Automatically Contains —
(1) Customer's Code
(2) Representative's Code
(3) Discount
(4) Quantity Shipped
(5) Product Company Code
(6) Product Code
(7) Royalty or H.G. Content
(8) Content Code
(9) Unit Price
(10) Invoice No.
FLEXOWRITE
Customer's Card returned for filing
Pull as required and return
Product cards contain Model or Part No. Description, Unit Price, Product Code, Royalty
Invoice No. written on tape by hand
Banda Master produced by Flexowriter
Note — Separate Masters for Units or Machines and for Spares
Separate Masters where different items have different deliveries
(a) AUTOMATICALLY TYPED
From Customer 1. Customer Name & Address
2. Customer Code (File No.)
Card 3. Representative Code & Name
4. Discount
From Product Card 5. Model or Part No.
6. Description
7. Unit Price
(b) OPERATOR MANUALLY TYPES IN
1. Despatch Address (only if different from invoice address.)
2. Delivery required and quoted
3. Customer Order No. and Date
4. Despatch Route
5. Invoice Number
6. Qty ordered and Qty Shipped
7. Certain variable information in Product Card when necessary
Customer Order
Customer Order
Banda Master
By-Product Tape
Kept in Plastic Folder
Checked — The main check is on quantities and that the right Customer and Product Cards have been used
DUPLICATOR
Banda
Store Copy
Packing Note
Advice Note
Office Sale File Copy
Representative order Copy
Acknowledgement
Sale Office Copy (if necessary)
To Despatch Dept.
To Representative
To Customer
To Sale Office or M.B.M.
(Consignments) (Proforma Transactions)
Customer Order
Banda Master
By-Product Tape
To Accounts
Checked for correct pick up of Unit Price, Qty, Discount
Customer Order
Banda Master
By-Product Tape
Filed in Outstanding File
ACCOUNTING MACHINE
National Accounting Machine — used to produce on
(a) BANDA MASTER
(1) Extension of each item of invoice
(2) Total for all items
(3) Discount (if any)
(4) Nett Total
(b) ORDER DAY BOOK SHEET
(1) Brief Customer Name
(2) Date of order
(3) Invoice No. (Automatic)
(4) Current — net total auto
Forward — transferred from Master
(5) 1000 Quantities
800 where
700 applicable
(c) Reps. order received Cards
(a) 4) (b) 3) (c) 5)

THE ORDER-HANDLING SYSTEM

electric typewriter but can also be programmed to type automatically information which is either read or keyed into it.

The carriage of the machine is controlled by the program and, acting under coded instructions, the machine positions the documents and types information into them at high speed. The information typed on the document is also reproduced in the paper tape, either completely or in part since the punching into the tape can be selectively controlled.

The system evolved by Herbert Grange utilises all these features of the machine. The company deals with a large number of varieties of its main products, each involving different dimensions or designs (such as regulators with gauges and without gauges, with tee-bar or plastic handwheels, etc). There are several thousand different items, and for each item there is an edge-punched card containing the model or part number, description, unit price, product code and royalty. There are also nearly 5,000 customer edge-punched cards, containing the names, addresses, file numbers, representatives concerned, discounts and written date regarding credit standing and representative calls.

The reading head of the Flexowriter is used in the initial stages of the processing of an order to pick up this information from the punched cards. Credit standing is verified from the customer card, and the orders sorted by representative. The order is typed by the Flexowriter on a Banda master, and the operator can use the machine as a normal typewriter to type in the variable information—customer order number and date, delivery requirements and quoted despatch route, invoice number, quantities, etc. The Banda master is used for duplicating as many copies as are required in processing the order.

Copies duplicated from the Banda master are as follows: stores, packing, advice note, office sales file copy (all sent to despatch department), representative copy order (sent to representative), acknowledgment (sent to customer) and sales office copy, if necessary (this is needed for consignment or Pro-forma transactions only).

The Master copy, the original order and by-product tape delivered by the Flexowriter are sent to the accounts office, where each item is extended and entered on 'total orders received' sheets and 'representatives' orders received' sheet. An additional record is kept of forward orders, showing month required, value and numbers of units.

On despatch, the stores copy of the order is stamped 'order completed' or quantity actually sent entered in the appropriate column. The method of packing is noted. The packing note is put in the parcel or case to the customer. The advice note is returned to the general office and sent to the customer under separate cover on the date of despatch.

The sales office file copy is returned to the general office showing the same information as the stores copy but with the addition of the postage incurred. It is joined to the appropriate master copy, etc, which is removed from the outstanding order file and transferred to alphabetical sorting file for easy reference. One sorting file is used for complete orders, one for orders on which there is a balance to come. With completed orders the despatch information is added to the master copy and totalled. For part deliveries, the system calls for a new master to be produced on the Flexowriter showing actual part delivery. A second new master of the new number is produced for balance items only.

To obtain the analyses, the by-product tapes, together with total invoice values, are sent to the IBM Centre in Birmingham every month. The information on the tapes is transferred on to punched cards on IBM 046 or 047 machines. It is then extended on a 604 calculator to give the monthly total net value, total net royalty, and total non-royalty values. The cards are tabulated on a 421 accounting machine for the balance control value.

Analyses required are an invoice report, a special customers' report and a product analysis report. The invoice report contains: Invoice number, non-royalty value, royalty value, Herbert Grange content, and total value. The Herbert Grange content consists of items on which no royalty is paid because they are bought in this country and are not subject to licence.

The special customers' report contains: customer number, discount rate and total net value. The product report contains product number and number of items.

The work at the Centre occupies between 10 and 20 hours a month according to the volume of orders.

The invoice report is used in totalling royalty payments. Prior to mechanisation, one man was employed full time on the preparation of royalty analyses. Considerable executive time was employed in verifying the accuracy of these analyses.

The special customers' report assists in the administration of the representatives' bonus scheme. The by-product tape will show, for instance, how many sanders have been sold, of what particular type, and this enables the bonuses to be calculated. Additionally, orders can be analysed for type of customer, for amount of business at various discounts and so forth.

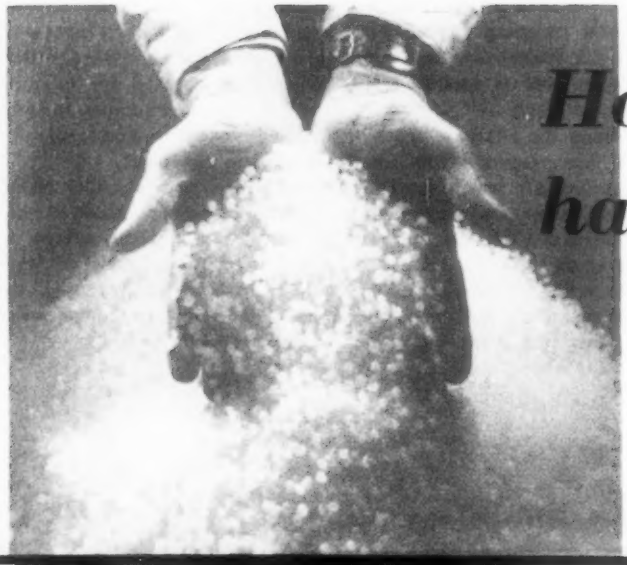
The product report is useful from a production point of view in assessing future trends.

The Flexowriter ensures greater accuracy in less time. It saves time in the sales office, where orders have to be checked for quantity and correct model number. In some cases, 20 or 30 invoices may be involved in one order.

Since the system was adopted the number of orders received has increased by 25 to 50 percent, so the decision to mechanise the task has been fully justified from the point of view of coping with increased volume of work.

How they transmit

component requirements



How they handle orders

Robert McKinnon

Two examples of low-cost data handling systems indicate what present data transmission equipment can provide for production control and order-handling

DATA processing—if we stretch the term—by teleprinter is nothing new. While teleprinter data processing systems do not pretend to compete with electronic computer or calculator systems, there are numerous, and relatively straightforward, data handling chores which, though they may not yet justify the sophisticated type of data transmission equipment now being offered in the USA (and in Britain, to a limited extent), require something more advanced than the traditional combination of pencil, paper, typewriter, post and telephone.

It is in this field that the teleprinter can achieve considerable savings, provided managements are prepared to make a thorough study of the machine's possibilities in relation to the job to be done.

By harnessing the teleprinter's ability to transmit and receive information either in plain language or in punched tape, remarkably efficient systems can be devised either within the confines of one factory or between dispersed plants in the same group.

Two typical, yet dissimilar examples of what can be done are provided by the system in operation at the Dagenham plant of the Ford Motor Co Ltd and the teleprinter network of Bakelite Ltd. Both of these exploit the basic function of the teleprinter (the transmission of written information by wire from one point to another). The Ford system is confined to one section of a huge works and uses plain language. The other links a number of factories, warehouses and offices and uses punched tape.

'MARRY UP' SYSTEM

The purpose of the Ford installation, which is situated in the company's new Paint, Trim and Assembly (PTA) plant, is to ensure the smooth flow of assembly work by arranging for the components for each car to 'marry up' according to customer specification. To appreciate what this entails, it must also be understood that there is no such thing as the mass production of cars; there is merely the mass production of components. Thus, when customer preference is taken into account on such things as type of engine, body colour, upholstery, suspension, electrical fittings, not to mention a whole range of 'extras,' the number of 'different' cars in any one model range can run into thousands.

If, then, the correct components are to go into each car in an assembly operation involving more than 1,000 cars a day, the men on the assembly lines must obviously be given details in advance of what is coming along the line. At one time, this involved a number of men running from one assembly point to another with bits of paper in their hands. It was a clumsy and time-wasting method, and vulnerable to error for, in a noisy factory, it is the easiest thing in the world to get a garbled version of a telephone message.

The men in the Production Control Office, dissatisfied with this state of affairs, carried out a study of possible systems which could eliminate the problems mentioned. Finally, they decided that a teleprinter network would be the best solution for, among other things, teleprinters offered the advantage of instantaneous communication to as many points as desired and at the same time would provide a permanent written record of all data at both transmitting and receiving points. Another point was that these machines could be operated by the men themselves who could learn as they went along.

The key stages in the assembly process are as follows. At Dagenham Ford's conveyor system for the movement of car bodies is entirely automatic and has a total length of nine miles. At the

Teleprinters offered the advantage of instantaneous communication to as many points as desired. Another point was that these machines could be operated by the men themselves . . .

same time, the PTA plant contains three separate assembly systems, one each for the company's light, medium and large cars—that is, for the Anglia, Popular and Prefect, for the Consul, and for Zephyrs and Zodiacs. The conveyor system incorporates cross-feed lines and, once a car has been moved on to one of these, its sequence cannot be altered. This is of key importance to the teleprinter system, as is shown later.

Body shells are sent from the Body Shop by way of a 725-feet long enclosed bridge to the Paint Shop which is on the first floor of the two-storeyed PTA plant. After painting, the car bodies are lowered on to the trim lines on the ground floor and conveyed along a series of parallel lines during which they are fitted with floor felts, head linings, door trim pads, windscreens, radiator grilles, brake and clutch pedals and other components. Meanwhile, engines, transmissions, front and rear suspensions and other parts are being delivered from the main factory and routed by floor conveyor to the final assembly line to await the trimmed car bodies. Wheels and tyres are meanwhile arriving by overhead conveyor, and seat cushions on another.

At the point of transfer to the cross-feed lines, the trimmed bodies are lifted from floor level to a high-level conveyor. Next, each body is lowered on to its own engine-gearbox-axle assembly and, at the end of the final conveyor, the completed cars are driven away for inspection and testing.

The teleprinter network controls this flow in two ways. It provides an 'early warning' broadcast and a 'late warning' broadcast to key stations and assembly points. The early warning

is sent out from a teleprinter transmitter located in the Paint Shop at a point before the car bodies enter the final enamel booth. Its object is to ensure that specific components are made available at the next stages. It is at this point that a car is allotted a line serial number, so the transmitter sends, details to the following points: instrument clusters and tail lights assembly; seat backs and cushion stocks; front suspension assembly; stock foreman's office; production control office; and the engine assembly plant. This last is situated about a mile away from the PTA building and sends its engines by road. These are taken to their assembly points by fork-lift truck.

Should the final enamelling not match up to the company's standards, the car body is taken out of sequence for further treatment. Similarly, on the journey from the head of the trim line to the cross-feed line, some other fault may be detected; if so, the car body is held back.

This is the reason for the late warning system whose teleprinter transmitters are sited at the storage points (junctions) between the trim line and the cross-feed lines. These transmitters send out final, unalterable information to the receivers at the assembly points for engine dress, wheels and tyres, seat build-up and export tool-kits. In other words, the late warning system is to ensure proper sequence control information reaching the assembly workers concerned.

To make the job easier, Fords have designed a special pre-printed form with space for more than 30 separate details. The equipment itself (supplied by Creed & Co), is maintained by Ford technicians; the network is manned, as anticipated, by Ford employees who learned through practice how to operate the machines.

Resultant benefits to the company include a considerable saving of time, a higher degree of accuracy and the ability to operate on lower stock levels. Most important of all, perhaps, is that the assembly workers themselves rely on the system.

COUNTRY-WIDE NETWORK

The teleprinter system operated by Bakelite Ltd is designed primarily to handle the company's vast order traffic. The network links its factories, sales offices and warehouses which are dispersed throughout England. The nerve centre of the system is located in the London head office from which radiate lines catering for two-way communication with the factories at Tyseley (Birmingham), Aycliffe in County Durham and Ware in Hertfordshire. Through Tyseley, the network links London with the company's sales offices in Birmingham and Manchester. Also incorporated into the system are the warehouses at Wembley, Pensnett in Staffordshire and Ardwick (Manchester).

The backbone of the system is of course the London-Tyseley link which has three two-way traffic circuits because, in addition to the heavy order traffic between these points, both London and Tyseley act as relay stations. The lines between London and Aycliffe and London and Ware are straight point-to-point links with no branch lines. All locations have both transmitting and receiving equipment, except the warehouses which need receivers only. In addition, special 'jacking' equipment at London and Tyseley enables any transmitting station on the circuit to keep in touch with another if, for any reason, London or Tyseley should be 'off the air.'

This, very briefly, is the layout of a network which handles comfortably a volume of traffic amounting annually to some 150,000 orders and about 50,000 other business messages. Not only this, but using pre-printed stationery with intelligent form design a single keyboard operation produces all the various documents needed by the firm and the customer.

All order traffic is sent over the network in the form of 5-channel, code-punched paper tape. This is prepared off-circuit (that is, without transmission in line) as a by-product of the typing of the original order documents. Data in tape form is then fed into an automatic transmitter and is received at the other end as printed page copy. In cases where a message has to be relayed on to another station, reception of data can also be had in punched tape form simultaneously with page printing.

Suppose, for example, that details of an order are being sent from London to the Birmingham sales office. The information will first be received at Tyseley which will simply feed the tape record of the message into its transmitter serving the Birmingham circuit. Similarly, London acts as a relay station for traffic from Aycliffe and Ware to Tyseley and stations beyond.

Relay working has advantages of economy as well as of efficiency, since the lease of a circuit costs a fixed annual sum irrespective of the amount of messages passed over that circuit. Relay working thus does away with the need for lightly loaded circuits between all stations in the network, which is another way of saying that the fewer the circuits, the smaller the cost.

Relay working apart, there are two other important reasons for using punched tape. In the first place, it enables messages to be sent more quickly, operating as it does at a speed of 66 words per minute, a rate well beyond the capacity of almost any teleprinter operator. Secondly, tape operation—being automatic—is more accurate and not subject to human error.

However, it is the company's well-planned use of stationery which doubles the benefits of the network. Whether an order comes in by post or telephone, its details (including a customer's

control number) are at once set out on a pre-printed form known as an 'editing sheet.' This sheet is then passed to a teleprinter operator who types the details on to a six-part order set using an off-circuit teleprinter with tape-punch attachment. These order sets are in the form of continuous, sprocket-fed stationery, each set comprising an invoice, customer's acknowledgment, sales representative's copy, accounts receivable copy, one 'orders received' and one 'orders despatched' copy. Thus all these documents are prepared from a single typing.

As the documents are being typed, the machine is of course producing a corresponding punched tape. Before this tape is sent out, details on the original editing sheet are checked against those on the order set. As a further precaution, the tape can be run through an off-circuit machine to obtain a plain language print-out.

When the documents have been 'proved,' the tape is fed through the transmitter serving the factory concerned. At the receiving end, the details are simultaneously printed as plain language letters and figures on another six-part set which includes despatch, advice and packing notes and various works planning documents.

Where the material is in stock, the warehouse can receive its despatch documents on the same day that an order is received, while orders which have to be manufactured are received by the works a day earlier than by postal method.

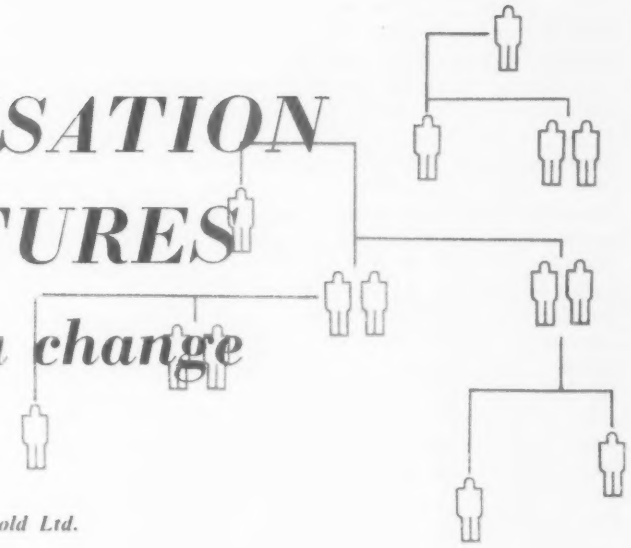
One of the most surprising features of the Bakelite network is the low annual cost of operation and maintenance. Only 23 operators, including supervisory staff, are needed, and their salary bill plus the cost of renting the lines and equipment comes to only £18,000 a year. This represents a cost of less than two shillings per order including a full documentation of the order. Looking at the cost as a percentage of the total value of orders received, the cost of handling is a mere .001 to .002 percent of the total sales figure—and Bakelite receive annually orders to the value of more than ten million pounds.

The outstanding feature of the two systems described is their basic simplicity. In each case the company concerned studied what should be done and set about finding the simplest yet most effective way of doing it. Neither system carries any surplus weight; there has been no attempt to be cleverer than the job required. But they remain examples *par excellence* of making the most of a machine that can send written or coded data from one point to another and of combining this uncomplicated function with the intelligent use of printed forms.

Tapes can be prepared 'off-circuit' and then fed into fast paper tape transmitters.

ORGANISATION STRUCTURES

are in for a change



T S Bayley, *Urwick Diebold Ltd.*

That organisation chart that took the O and M department so long to compile may become suddenly out of date when automatic information processing is adopted throughout the company

INFORMATION is the life blood of commercial enterprise, as it is the life blood of all dynamic man-made systems. Although this truth should be self-apparent, until recently very little has been done to find the sources of this vital raw material and to trace its flow through an organised activity. The development of superior tools for dealing with information and the beginnings of an 'information technology' already show signs of bringing about a near-revolution in business management.

Harold J Leavitt and Thomas L Whisler, in their provocative 'Management in the 1980's' (Harvard Business Review, November-December, 1958), pointed to a future commercial organisation in which almost all operations would be highly programmed, including most of the decisions made by what we now call middle management. They gave examples to show that, even now, many business decisions formerly based on judgment can be better made by following some single routine devised by a staff man whose company experience is slight, whose position on the organisation chart is unclear, and whose skill (if any) in human relations was picked up on the playground. They predict that the void created by the disappearance of the unfortunate decision makers will be filled by (1) information technologists, and (2) innovators and researchers. At the pinnacle of a highly centralised management Leavitt and Whisler place 'committors' and co-ordinators.

As dismaying or as glorious as this prospect may appear, there is some evidence to support this line of thinking in the brief history of business computers, and in the similarly brief history of information technology. The emphasis on today's research into information handling machinery and techniques indicates further support for their 'predictions.' This research has largely taken shape within the two years since their article appeared.

Here, an attempt will be made to trace patterns in the still confused history of automatic data processing and its related techniques in order to demonstrate the organisational effects of the introduction of the new technology, to see what these effects hold for the near and distant future and, finally, to show what practical steps today's management can take to get full advantage from this most important technological advance.

The early twentieth century brought with it three important phenomena: the specialisation and fragmentation of labour, the division and decentralisation of managerial control, and the departmentalisation of clerical information processing. At the same time appeared many of the clerical labour saving devices with which we are now so familiar. Taylorism, decentralisation and delegation served the human organisational purposes of the new industrial era quite well in the production side—not so well in the information handling functions. The tools available for information handling were far too primitive to permit the channelling of information into consistent and reliable paths. The result was that an overwhelming burden was placed on the manager. As the product, and the organisation, production and distribution methods became more and more complex, the manager was forced to take decisions in most situations on the basis of incomplete or non-existent information.

At the same time, the departmentalisation of clerical labour seemed only to breed more clerical labour, and the costs of handling information threatened to swamp the productive process itself. An entire level of middle management arose whose major duties appeared to be the control of this complex mushroom. And, the quality of information did not improve very much.

In the 1930's, better tools for processing information began to appear. The most impressive of these were punched card processing machines. The major advantage of these machines is that, by their speed and reliability, they can replace the 'lower' forms of clerical labour. Their second important advantage is that they demand a systematic flow of information. However, the technological advances represented by this generation of machinery began to look very minor in the face of increasing pressure for more and better information. The effect of these machines on business organisation was relatively minor and 'white collar' costs continued to rise.

One historically important organisational development of this period was the creation of the 'machine accounting' or 'data processing' department. Although almost always a subsidiary service organisation, it often serves as a foundation for centralised computer operations. Even though the department may represent a simple centralisation of previously dispersed accounting machine operations, its establishment was the first important sign of the coming trend in information processing.

At this point enters the computer. Even in its earliest days, its speed of processing is of a fantastically greater order of magnitude than its predecessors. It is obviously a very superior business machine. More important than its speed is its ability to perform a complex series of operations automatically and thus to undertake a much higher level of clerical task. It can make 'decisions' in any procedure for handling information that can be handled in a routine manner; the very idea sent shivers of anticipation through the business world!

However, the history of the development of electronic computers, and their applications, has been fully chronicled up to the present time. The organisational effects have not. These are now becoming apparent.

A definite trend toward centralisation accompanies the introduction and successful operation of an automatic data processing system. It takes these forms:

1. Centralisation and consolidation of files.
2. Centralisation of control over the origination and subsequent flow of data.
3. Centralisation of the data processing functions.
4. Centralisation of reporting and report analysis.
5. Centralisation of forecasting, planning and control of productive capacity.

These forms of centralisation are possible—and highly desirable—because of the computer's ability to integrate clerical processes. Although it is often an excellent device for replacing labour (it usually, but not always, is very superior to punched card and other accounting machines), its truly outstanding feature is its ability to operate on a mass of data, and by doing so to prepare necessary outputs while keeping centralised records up to date. This leads naturally to the concept of integrated systems. This, simply stated, means that if we are able to operate upon and relate a large number of variables, we will design our systems to bring all variables together through the shortest possible routes and to feed back information through the shortest possible routes.

It follows that any organisational barrier to the transmission of information to a central point will be overcome in the process of building up an integrated system. This is made easier by the replacement of many clerical functions by computer functions. Thus, we have already begun to see a number of cases where such departments as billing, order processing, accounts receivable, payroll, and to some degree cost accounting, have already merged into a clerical organisation with two loosely defined sections: data processing and input preparation. Now we are beginning to see the merging of production planning departments with plant scheduling departments and the disappearance of inventory control departments.

As a result, the data processing and the systems

procedures departments become more and more important in the organisational structure. They threaten to break away from their usual position under the chief accountant and assume a place on a line equal with him. An important trend in very large American corporations is the formation of a new kind of organisation at group level. A vice-president for administration has a business systems department reporting to him. In one prominent corporation this department has three sections: (1) Equipment, (2) Systems, and (3) Research. This department is responsible for setting standards on equipment and systems throughout the company, reviewing the action and plans of the operating organisations, providing general information and training, and investigating new equipment and new systems ideas. The same general structure is reproduction in the major operating companies.

In general, the advent of the computer and the development towards integration has had two important organisational effects: the centralisation of information processing and control, and the up-grading of data processing and systems functions in the organisation structure.

The recent emergence of one form of information technology, the mathematical relationship of probabilities to firm and variable data, has not yet had a significant impact on organisational structure: but the promise it holds out of better planning and better control certainly implies very important consequences. Its major effect will be a further blurring of the distinction between 'line' and 'staff.' This is reinforced by the present development of efficient computer-communications systems; when all important activities of an organisation can be tied together in an electronic information network, with computing facilities located at central and intermediary control points, then effective central control based on complete availability of information becomes truly possible. The same persons who design such systems will in effect operate them.

This does not imply that information technologists will run the business. But it will perhaps free the policy makers and creative organisers from much of the burden of daily operating crises in the control of company resources. And the availability of an effective planning technology will encourage such creative activity.

Other current research is devoted to reducing or eliminating the effort of transcribing information into a form acceptable to an automatic data processing system. Character reading machines generating input media as by-products of their primary function, 'data gathering' equipment, and direct communication with the computer system are the basis for steps in this direction. The effect of these developments will be to make drastic reductions in many large clerical organisations and the supervisors and middle management associated with them.

Thus, evidence points towards the kind of organisation envisaged by Leavitt and Whisler. Their prediction is for the 1980's. What are the intermediate transition steps?

First, increasing emphasis on the importance in the organisational structure of the data processing and systems planning functions.

Secondly, a drawing back to central management of the planning and control of production.

Thirdly, a shrinking and further consolidation of clerical organisations.

Why is it not possible to go to the predicted structure as soon as present equipment research is completed? Of course, there is a natural lag and resistance to be overcome. But there are two equally significant reasons:

(1) The supply of information technologists, from straightforward systems designers through to information theorists, is extremely small, and

(2) It will be a long time before great progress can be made in determining, in general and for each organisation, all the information needed for effective control.

The latter calls for research projects of considerable proportions. At present, in fact, large sums are being spent in America, generally by the Federal Government, on such areas of study as information retrieval, logistics planning and control, and large-scale data gathering and analysis systems.

What can management do now to prepare for this future? The key words are education, study and planning. Management must become more than familiar with equipment and techniques, and must form the nucleus of an efficient information systems planning staff. Management must initiate and support extensive study of information requirements and control systems. Management must plan a programme which allows the introduction of data processing and communications systems eventually compatible with an integrated system. These are expensive but essential steps.

Perhaps the most important of these is the formation of a systems planning group, and the general up-grading of the systems function. The work of planning cannot be effectively accomplished at a subordinate organisational level, nor can it be carried out by designers of business forms and time study engineers.

Is this worth all the trouble? Yes. If you do not do it, your competitor will, and the promise of higher productivity and of greatly improved flexibility is too attractive to ignore in an increasingly competitive commercial world.

One more for the range

A NEW addition to the IBM range of computers which was announced recently both in Britain and the USA is the 1410. At the same time IBM announced three developments to the 1401 computer—this machine may now be linked to a Ramac disc store (1405) and may work with paper tape input (1011) and a direct console enquiry station (1407).

The 1410 extends the range of the company's 1400 series and makes available a wide variety of system complexes. The 1410—itself a medium size machine—uses the same disc store, input, output and other peripheral devices as the 1401, so that it will be possible for a user to change from a 1401 to the new system with a minimum of changeover costs.

The system's central processing unit (1411) provides for 10,000, 20,000 or 40,000 alphanumeric characters, and can perform 600,000 additions in a minute.

A feature of the 1410 is a second data channel on which processing can be carried out independently from operations on the first channel, and complete overlapping of reading, writing and computing is possible.

Up to a limit of 20 magnetic tape units may be linked up to the system. (The intermediate speed 7330 magnetic tape unit may be used with the standard 729 tape units in the same operation.) In addition up to five Ramac units, each of which can store up to 20 million characters, may be linked to the 1410.

Comparisons between the 1401 and the 1410 show that the internal speed and the maximum core store capacity of the latter is approximately twice that of the 1401.

The 1011 paper tape reader can enter data directly into both systems, and will read five, six, seven or eight channel tape at the rate of 500 characters a second.

An approximate minimum price for a 1410 card system, including a 600-line printer, is £119,000. It will probably rent at about £2,650 a month. For a 1410 tape system with four tape units, equivalent figures are £177,000 (to buy) and £4,050 (to rent).

A Ramac 1401 system is likely to cost a minimum of £75,600.

Who Wants What?

Again the 'situations vacant' columns of two national newspapers were scrutinised and the catch after three weeks was 33 advertisements that relate to vacancies in the data processing field—these represent some 50 jobs available by open tender during that period.

The advertisements fall into five categories:

1—Accountants required
2—O and M or systems people required
3—Programmers
4—Jobs with data processing equipment manufacturers
5—Other vacancies, such as for punched card manager.

There were roughly about the same number of advertisements for jobs in the first four categories (*ie.* seven to nine) and only two for the last category.

Barely a day passes without some organisation hunting for accountants, but recently it has been noticed that a number of companies rate 'knowledge of computers or data processing methods' as one essential qualification. Of course accountants, like other creatures, have varying importance attached to them. At one end of the scale Cooper Brothers held out between £3,000 and £3,500 and a car for a chartered accountant required by 'a company which manufactures branded lines of consumer goods' and which had developed its accounting system through budgetary control and standard costing techniques and installed a computer. No age range was suggested. Lower down the scale a 'national retail organisation' bid a minimum of £1,500 for a chartered accountant (age 26 to 30) interested in office management techniques and the development of 'retail stores systems.' Between £950 and £1,250 was offered for an accountant to take charge of a punched card accounting department; and a vacancy for a young qualified accountant occurred in an 'international company in West Middlesex' due to the introduction of electronic data processing.

Anonymity in this batch, however, was the rule. Only Textile Machinery Makers Ltd were unashamed to publish their name in a quest for a cost accountant of 25-35 years with experience of budgetary control, standard costing and the use of punched cards. They failed, however, to indicate a salary range.

Out of nine advertisements for O and M officers or systems analysts not one gave the slightest idea of salary range. Still there was less anonymity here.

Richard Thomas and Baldwin required for Ebbw Vale a man of about 30, experienced in punched cards, to participate in computer feasibility studies and do systems work.

Both Michelin Tyre and Massey Ferguson required senior staff with sound experience in clerical method study, data processing and management control—in Massey Ferguson's case for a new organisation and methods department.

Monsanto required a senior O and M assistant, aged 28 to 35, to undertake, under company's administration manager, appraisals of organisation and administrative matters on a company-wide basis. Although O and M experience, a degree or an accountancy qualification were desirable, Monsanto were prepared to consider other candidates without this background.

The Metal Industries Group appealed for O and M and assistant O and M officers—in particular young men with a background of management consultancy and work study who wished to gain experience of organisation and methods work.

Only the De La Rue Group seeking applicants with experience

in administrative procedures held out any hope of the O and M officer graduating to non-specialist 'senior management positions'!

Money is more freely mentioned when recruiting programmers—£1,500, for example, is the bait General Accident Fire and Life Assurance put out for a chief programmer to work with an IBM 1401 computer. In contrast a manufacturing firm in the north-west also with programs to prepare for a 1401 offered a senior programmer a salary of not less than £1,000.

ICI, seeking programmers to work on the Dyestuffs Division's Pegasus system, invited either experienced people or others interested in being trained—in this case a degree in mathematics or economics or an accountancy qualification was desirable. The age range was 22 to 30, and ICI fell back on the old formula where salary was concerned: 'the initial salary will depend on experience, age and qualifications'. The post offered 'good prospects for promotion'—but promotion to what?

Both BEA and BOAC visited the market place for programmers. With BEA a degree, an accountancy qualification or high proficiency in mathematics would have got you a job as a team member for programming the Emidec, and a maximum of £1,190. Another BEA advertisement sought programmers with some background of systems analysis and offered up to £1,367 a year. This would seem to have been for people to work with a project team planning to install an on-line computer system for airline reservations. •BOAC required male or female programmers, knowledgeable in systems and methods work, with a minimum of one year's experience of commercial programming and a high standard of mathematics. The age range was 21 to 30 years and the salary range £890 to £1,190 per annum.

Programmers are still in short supply. One company which tried to recruit a chief programmer found first, that the response to its display advertisement was poor and secondly, that of candidates that wrote in none met with its requirements, although a good salary was offered. To this kind of impasse there are two solutions: either to bid a higher price or to try to 'discover' candidates by other means than by advertising, and—having discovered them—to try to lure them away from their present employers.

The computer manufacturers, like the poor, are always with us, and always looking for staff to expand their activities. Hence English Electric, EMI, ICT, Leo and Standard Telephones were on the prowl. IBM Ireland sought a systems analyst and offered £1,500 a year to start. Most significant of the manufacturers advertisements was one by Olivetti. British Olivetti were recruiting two founder members for their first data processing team in Britain. Men under 35 years with at least three years' experience as sales representatives were offered up to £2,000 a year. (A note on this Olivetti development appears on page 6.)

Last to be considered is an advertisement which throws some light on how much a career in punched cards will bring. A punched card manager, aged 24 to 35 years, was required for a new installation in south east London. The salary scale was from £800 to £1,100 per annum. The prospects were excellent and the ad said O! joy of joys—'no Saturdays'.

COURSES AND CONFERENCES

12 December
Four-day Computer Appreciation Course
Organised by International Computers and Tabulators Ltd
Venue: ICT Computer Centre, Putney Bridge House, Putney Bridge Approach, London, SW6.
Enquiries to: The Administrator, ICT Application Training Centres, Moor Hall, Cookham, Berks.

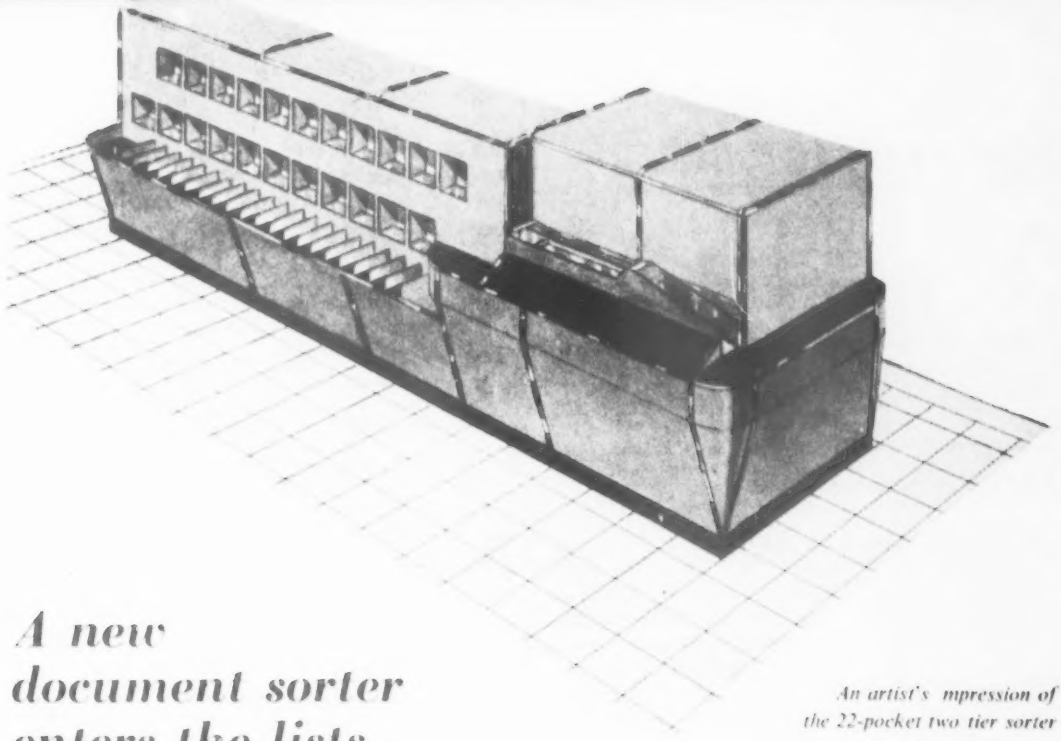
3—5 January
Punched Card Introduction to Computers
Organised by IBM (United Kingdom) Ltd
Venue: IBM (United Kingdom) Ltd, 101 Wigmore Street, London, W1.
Enquiries to: IBM (United Kingdom) Ltd, Educational Dept, 101 Wigmore Street, London, W1

4—13 January
Programming the Pegasus Digital Computer
Organised by The University of Southampton
Fee: £15 15s (for the course)
£11 11s (for residence)
Venue: Southampton University
Enquiries to: The Director, Computation Laboratory, The University, Southampton.

2—27 January
1401 Data Processing System
Organised by IBM (United Kingdom) Ltd
Venue: 101 Wigmore Street, London, W1.
Enquiries to: The Educational Dept, IBM (United Kingdom) Ltd, 101 Wigmore Street, London, W1.

9—13 January
'Autocode' for Ferranti Mercury Computer'
Organised by Computing Machine Laboratory, Manchester, 13.
Fee: £10 10s
Venue: Computing Machine Laboratory, The University, Manchester, 13
Enquiries to: Extra Mural Department, The University, Manchester, 13.

9 January
1401 Computer Appreciation Course
Organised by IBM (United Kingdom) Ltd
Venue: 101 Wigmore Street, London, W1.
Enquiries to: The Educational Dept, IBM (United Kingdom) Ltd, 101 Wigmore Street, London, W1.



A new document sorter enters the lists

An artist's impression of the 22-pocket two tier sorter

DURING the last three years the engineering division of Parnall and Sons Ltd (Bristol) has been working on a development programme to produce high-speed document sorting machines.

As a result Parnall are now able to offer machines designed specifically to meet customers' requirements in the area of document sorting. Having blueprinted a basic machine, the company say that it can be modified as required: for example, a number of reading systems can be accommodated, as also a wide variety of paper sizes and quality.

First applications for document sorters that spring to mind are in the banks with their cheque and voucher distribution problems, but the two companies that are currently offering American-built sorting machines in Britain report that companies from other industries have shown an interest in these machines. As sorting machines involve a 'reading' operation (this can either be magnetic or optical reading) in theory it is relatively simple to adapt a sorter so that it feeds information into a computer—hence cutting out the need to input into a computer through the medium of punched cards or paper tape. So for organisations that have basic objections to using punched cards or paper tape, sorters may have increasing appeal (as may computers specifically designed to work with 'hard' records, such as the Burroughs Visible File computer or a new machine, the National 390, developed by the American National Cash Co).

Parnall's machine sorts at a rate that may vary from 400 documents a minute when poor quality paper is used to 1,750 documents a minute when the documents are of high-quality paper. The basic machine has 22 pockets but more or fewer pockets could be incorporated as the machine is designed on modular principles.

The machine's feed mechanism, which ensures that only one document is fed into the system at a time, can be loaded with mixed documents—varying in size and weight—without any change in adjustment, so documents that vary from light commercial paper grade to punched-card quality can be sorted in the same run.

At present the following reading systems are possible with the Parnall sorter:

1—Recognition of magnetic ink characters using the EMI 'FRED' type-face with a single read head, plus a memory store.
2—A simple magnetic ink dot code system with a single read head and memory store.
3—A simple dot code system but using photo-electric reading of conventional or fluorescent ink markings.
4—A simple code system using punched holes with a photo-electric reading head.

Other possible variations would be by using a multiple reading system—with one reading head for each pocket, thus eliminating the need for memory store.

SURVEY—PART III

Facsimile Systems

DATA transmission has become the focus of considerable interest over the past few months; a conference has been held at Dent, and the subject has been discussed by the Computer Society, Dr. Wilkes contributing a learned paper. And equipment for transmitting data from point-to-point comes within the scope of our Survey.

Facsimile transmission forms a small part of the total transmission field, but it is an important one. The facsimile method enables original documents, such as cheques or bills, to be transmitted over considerable distances and reproduced identically at the remote station by a method of photo-scanning.

The methods of facsimile transmission vary in detail but basically the operation is as follows: the original documents, which could be a cheque, or a portion of a tally roll, a production graph or sketch, or a bill, is put in a transparent envelope of a specified size. This is inserted around a cylinder on the transmitting apparatus. Attached to the cylinder is a scanning device; basically this consists of a means of illuminating a certain portion of the cylinder and reflecting back the light on to a perspex screen. From here the light which will vary in intensity, depending on whether the area scanned is black or white, is translated by a photo-electric cell into electric pulses of varying intensity which are transmitted down the wire to the receiver at the remote station. The scanning takes place as the cylinder revolves, so that the whole area of the paper is scanned.

At the remote station the cylinder or recording band of the receiver is activated by the transmitter and revolves in phase with the cylinder on the transmitter. Current is transmitted to a stylus (or helix or whatever method is used) and the stylus re-acts with the paper to produce a facsimile impression.

Transmission equipment can be either one-way or both-ways, that is to say, it is possible to have a transmitter and a receiver, or two transmitter-receivers—or 'transceivers' as they are usually called—which can both transmit and receive. A receiver can normally operate without human intervention, rather on the lines of a teleprinter page receiver, producing a continuous record. The transceiver is limited in the amount that it can receive, by the size of the transmitting/receiving cylinder.

Certain equipments have multiple means of transmission and reception. An input equipment, somewhat similar to a telephone switchboard, allows several transmitting outstations to be connected to a central receiver. In the same way a broadcaster unit allows a central transmitter to send out messages to several outstations simultaneously.

It is possible to envisage many applications for facsimile systems. The Westminster Bank and several other banking and monetary concerns use such systems to connect their branches with head office. One system enables cheques presented at the branches to be referred to head office for verification of signatures, all in a matter of minutes. A large firm of publishers transmits proof pages to and from their printers by facsimile equipment. Order control is another application for which facsimile systems are utilised in this country, orders being entered at a number of branches, received in a continuous flow at the central data processing unit, and passed straightaway to the computer department. In the USA the applications are even more varied; the linking of authorised car dealers with a central loan bank facilitates car purchase, the loan form being made out at the dealer's, and transmitted to the loan bank. The bank can check its records, give its approval, have a signed filing record of the transaction, all in a matter of minutes, even though the original record remains with the dealer. Issuing rail and air tickets, and linking remote outstations and a central booking bureau is another application.

Facsimile systems answer certain needs; where, for example information is urgently required and needs to be broadcast to several points; where information has to be transmitted with maximum accuracy, using the original record as the source document; and where information must be trans-

mitted by staff without either technical or typing expertise. It does not require very much practice to load a piece of paper, to ensure that the remote station is in phase and then to press a starting button.

Unless it could be used in conjunction with electronic reading machines, the output of a facsimile transmission system would not be a direct computer input medium. But in certain cases a facsimile system could serve as the link in an integrated processing system where processing would be in part manual and in part mechanised.

There are four types of facsimile system marketed in Britain, and these are reviewed below.

The Mufax System Maker: Muirhead and Co Ltd

This system consists of a very large transmitter connecting up with a continuous page recorder.

Mufax uses the 'flying spot' method of transmission and reception. When the operator presses the 'start' button, this causes a start signal to be transmitted to the receiver, followed automatically at intervals by the phasing signal and the facsimile signal; as soon as the receiver is in phase and synchronising with the transmitter recording begins. The message area on the transmitter is scanned; light is reflected on to a screen and an aperture in this screen allows the light to fall on the cathode of a photo-multiplier cell which controls the signals to the line.

At the receiving end a helix electrode is revolving in phase with the transmitter drum. Electro-sensitive paper is fed between the helix and a straight blade electrode. The intersection of the helix and the blade forms a 'flying spot' which moves rapidly across the paper; the pulses transmitted by the sender cause the paper to be marked directly in proportion to the pulse intensity.

The Mufax system is able to transmit messages 14 inches by 8¾ inches—the equivalent of 900 typewritten words in single spacing—at a time, though smaller documents can be put on the drum. Two pointer controls on the drum, operating rather like the margin stops of a typewriter, restrict scanning within a given area, thereby speeding up the transmission and recording.

Electro-sensitive paper is loaded on the receiver in 200-foot rolls and checks are built into the machine to stop operation automatically just before the reel is exhausted. Other check features control automatic run-up of the paper, and of message indication, and a testing mechanism for correct automatic operation of the receiver.

The Mufax transmission is over high class telephone wires so that there is no limit as to the distance over which messages can be sent. The time of transmission would be, for a sheet containing 900 words single spacing, less than four minutes. (Between 2.8-4.5 minutes per 10 inches of copy.)

SPECIFICATION

The System 'hardware' consists of three items; a self-contained transmitter, the D-901; and D-900 Receiver, which comprises a receiver mechanism and an electronic unit.

The D-901 Cost: from £810-£990
Size: 23 inches by 10½ inches by 18½ inches.
Weight: 80 pounds (approx.).
Capacity: Messages of a size up to 14 inches by 8¾ inches with a real copy area of 13¾ inches by 8¾ inches.

The D-900 Cost: from £690-£710
Size: 1. Mechanism Unit 15½ inches width by 11 inches height, 12¾ inches depth.
2. Electronic Unit 19 inches by 9¾ inches by 11¼ inches.
Weight: 1. Mechanism Unit 32 pounds (approx.).
2. Electronic Unit 38½ pounds (approx.).
Capacity: Messages of any length and 9 inches wide.
Recording Paper: Cost per roll £1.17.6. (£1.7.6. for each roll of a carton of six.)
Type of Paper: Mufax 'C' electro-sensitive paper.
Size: 200 feet by 9 inches wide.
Capacity: Continuous reception of 160 documents (14 inches by 8¾ inches).

The Hellfax System Maker: Dr-Ing. Rudolf Hell

This system is manufactured in Germany and marketed in Britain by K S Paul (Printing Machinery) Ltd. It is basically a two-way system, with transmission between two transceivers, but it is also possible to have a one-way transmission between a transceiver (or transceivers) and a central continuous receiver.

The Hellfax uses the 'electro-mechanical' recording method. In this method the transmitting operator loads the drum and telephones the operator at the remote station, who would also load his transceiver drum, and bring down the recording head into the 'receive' position. The transmitting operator presses the 'start' button on his transceiver, and the receiving operator the 'receive' button; thereafter the two drums revolve in synchronisation and transmission will begin automatically.

Scanning takes place in much the same way as on the Mufax equipment, but the machinery for recording is very different. The signals received activate a tiny continuously re-inked wheel point pen (pivoted disc and spindle) which puts out a series of dots corresponding to the transmitted signals. These dots are linked to form the characters of the message, and as the definition is very high (2,500 dots per square centimetre), 850 characters per minute can be printed out by this method.

The great advantage of the Hellfax system is that it utilises ordinary paper for both transmission and reception. This not only means savings on paper costs, but also it means that multi-copy sets can be produced by this method. Up to five copies can be made out on the receiver drum (depending on the thickness of the paper). The Hellfax also allows spirit masters to be made out on the receiver drum. The transmission of smaller forms than the standard maximum (7.48 inches by 5.3 inches real copy area) is possible, using a transparent envelope. The Hellfax transceiver requires operator attention all the time, although it is possible to leave one blank form in the receive position for automatic unattended transmission after hours. With the receiver, unattended transmission is possible all the time, reception being continuous as dictated by the transmitter.

The transmission of messages is over almost any GPO line suitable for normal voice reception, so that there is no limit to the distance transmitted. The time taken to transmit a full message area (7.48 inches by 5.3 inches) is 4 minutes 50 seconds at a speed of 850 characters per minute.

SPECIFICATION

The Hellfax system 'hardware' can consist of two items; the transmitter-receiver KF 108; and the Continuous Receiver BS 115.

The KF 108 Cost: £307

Size: 20.8 inches (width) by 10.6 inches (height) by 11.8 inches (depth).

Weight: 32 pounds (approx.).

Capacity: Messages of a size up to 8.27 inches by 5.83 inches with a real copy area of 7.48 inches by 5.43 inches.

The BS 115 Cost: £475

Size: 14 inches (width) 9 inches (height) 8 inches (depth).

Weight: 43 pounds.

Capacity: Messages of any length and 8¼ inches width.

Recording Paper: Ordinary paper, plus four copies, depending on paper thickness; spirit masters for duplication may also be used.

The Desk-Fax System Maker: Creed and Co Ltd

This system can either be a two-way transmission system using transceivers; or a one-way system using transmitter and continuous receiver; or a comprehensive system using transceivers at outstations linking through a concentrator system to a central station receiver (or receivers), the central station also having a transmitter linked by a broadcaster unit to the transceiver outstations.

The method of transmission recording of the Creed Desk-Fax System is the moving stylus, high current electrode 'burn-off' method. In this method the transmitting operator loads the message on to the transmitting drum and sounds a buzzer at the remote station; the receiving station operator loads the receiving drum with the electro-sensitive paper and presses the 'receive' button; the two drums revolve in synchronisation and the transmission begins automatically. In the event of transmission direct to the page recorder, the necessity to press the 'receive' button and load the drum is avoided, and reception would be controlled by the transmitter, the receiver acting as slave machine.

The scanning system on the transmitter operates much as outlined for the Mufax and Hellfax systems, by the reflection of light on to a photo-cell which translates the light intensity into pulse form.

The pulses transmitted to a stylus-like electrode re-act with the electro-sensitised paper to 'burn off' the paper surface in a pattern corresponding to the original copy.

The advantage of the Creed system is that up to 20 transceivers or transmitters can be linked into a comprehensive system. The equipment is lightweight and portable. The system is also relatively inexpensive and simple to operate and control. The facility to broadcast to several outstations simultaneously is also useful. It is ideal for fairly short-range transmission (up to 20 miles).

The Creed Desk-Fax transmission is by private telephone wires up to distance of 20 miles. The time of transmission for a message with a useful area of 5⅛ inches by 2⅞ inches (approximately 150 typed words) would be between 2 and 2½ minutes, depending on the definition required. It is also possible for the equipment to receive a large transmitted message area, which it will reproduce in condensed form.

SPECIFICATION

The Desk-Fax equipment comprises:

The TR 102 Transceiver Cost: £160

Dimensions: 12½ inches (width) by 7 inches (height) by 12½ inches (deep).

Weight: 30 pounds.

Capacity: Messages of 6½ inches by 4½ inches with a real copy area of 5⅛ inches by 2⅞ inches (or messages of a greater over-all area reproduced in condensed form).

Speed: 2 minutes with 110 lines inch definition.
2½ minutes with 130 lines inch definition.

The T 200 Transmitter Cost: £125

Dimensions: 11¼ inches (width) by 7½ inches (height) by 12¼ inches (depth).

Weight: 28 pounds (approx.).

Capacity: Messages of 8½ inches by 4½ inches with real copy area of 7½ by 3 inches.

Transmission: Up to 2½ minutes for a fully utilised message area.

The T 205 Transmitter Cost: (Undecided)

Dimensions: 23 inches (width) by 8 inches (height) by 12 inches (depth).

Weight: 50 pounds.

Capacity: Messages of 8½ inches by 7½ inches with a real copy area of 7½ inches by 5½ inches.

Speed: 3 minutes for fully utilised message area (450 words).

The RS 500 Page Recorder Cost: £290-£305

Dimensions: 1—20 inches (width) by 22 inches (height) by 15 inches (depth).
2—Console model: 16 inches by 39 inches by 14 inches.

Weight: 1—100 pounds.
2—Console model: 150 pounds.

Capacity: 1,100 messages of dimensions 8½ inches by 4½ inches with a real copy area of 7½ inches by 3 inches (larger messages produced in condensed form).

Speed: 2½ minutes for a fully utilised message area (210 words).

Recording Paper: Cost per roll £4 (plus £1 purchase tax) or less if ordered in quantity.

Type of paper: Creed Tedeltos electro-sensitive paper.

The Concentrator C 602
Cost: from £80 (5-line connection) to £245 (20-line connection)

Dimensions: 21½ inches (width) by 9 inches (height) by 7 inches (depth).

Weight: 25 pounds.

Capacity: Groups of five outstation connections terminated on plug ended cords served by two receiving machines, up to a maximum of 20 connections. (Plug and cord connection with lamp and buzzer indication).

(Smaller model, C604, also available with connections to 10 outstations and four central office machines).

The Broadcaster A 910 Cost: £149-£300

Dimensions: 22¼ inches (width) by 7½ inches (height) by 13¼ inches (depth).

Weight: 25 pounds.

Capacity: Normal outstation connections would be for up to eight stations, but no real limit on capacity. (Push-button selection of stations; coloured lamp indications).

WHAT'S NEW

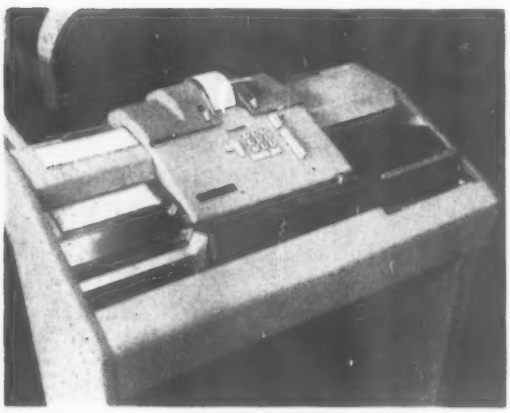
in systems, services and equipment

Versatile Tabulating Punch

ROYAL McBEE are marketing in this country their Keysort tabulating punch, which is already widely used in the USA for sales analyses, billing, production control, employee records, etc. The advantage of the Keysort is that it can utilise original records such as job cards or material requisitions, punch in data on the card, and produce tabulated records in visual tape form for further management analysis, all in one operation. In fact the whole operation can be carried out as a by-product routine of the normal accounting function.

The keyboard controlling the punching and reading is a 10-key model, with non-add, sub-total and repeat key features; it has a numerical capacity while listing of 10-digits in each of eight card fields, and 11-digits while totalling. Field indicators allow selective punching, tabulation, repro - punching and summary punching as required.

It punches . . . reads . . . prints



Cost of the machine is given as £1,350.

For further information tick SO1 on the reader enquiry coupon on page 39, or write to:
Royal McBee Co Ltd,
36 Worship Street,
London, EC2.

Storage Unit for Accounting Machine

A UNIT (or units) which will allow constant factors in a calculation, unit prices, standard deductions, to be held in store, and read out as required for each successive calculation, is announced by the Addo ADP division. Designed to give add-listing machines additional analytical capacity, the digit store unit(s) can be electrically connected to any Addo X machine, fitted with electrical input and output.

The basic unit consists of a cabinet 36 inches by 22 by 19 inches in which is housed power supplies, scanner and selection unit, and store capacity for seven 10-digit stores (with a plus or minus sign). A maximum of 81 stores can be connected to the Addo X, these being housed in identical cabinets containing nine stores each, interconnected by ply or socket connections to the basic unit.

A program bar on the Addo X controls the reading in of a number in the store into the machine register, or this could be done manually by bringing in additional digits, and the depression of the total key will cause this new figure to be written back into the store. The great advantage of this method is that a number is not erased from an address except by writing a new number, and constant factors can thus be stored and read out for successive calculations.

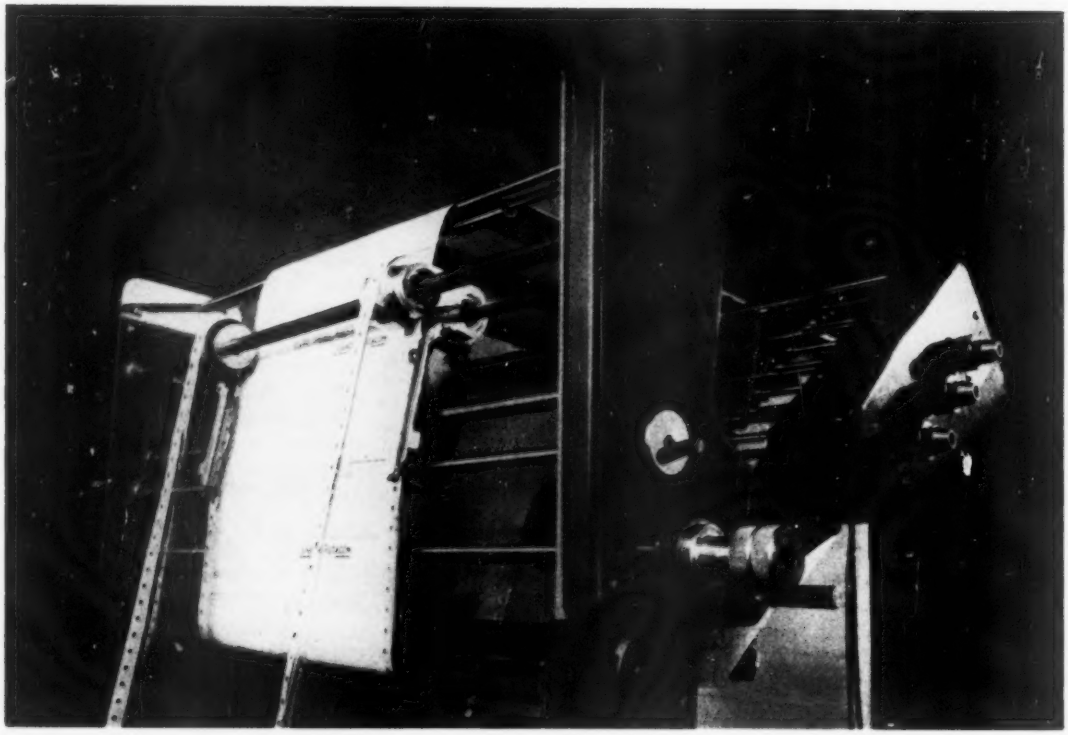
The provision of tape or card punching units, involving extra circuitry, will make this operation automatic. The whole equipment is designed to be as flexible and as economic as possible. Approximate cost of the basic unit is £1,200.

For further details tick SO2 on the reader enquiry coupon on page 39 or write to:
Bulmers (Calculators) Ltd.
Empire House,
St Martin's-le-Grand,
London, EC1.

Projector Teleprinter

A PROJECTOR printer, developed to allow teleprinter messages to be flashed on to a large screen for conference viewing, had a public baptism of fire in a mass medium when it was used recently in a BBC TV programme to relay the results of the US Presidential Election. The information was received on teleprinters from the various news agencies and processed on to punched tape into the printer.

The projector printer consists of a modified Creed 75 which prints out on a 5-inch wide roll of cellophane film. The film is then projected on to a large screen—a seven foot by five line screen in the case of the BBC telecast—by means of back projection. Up to 17 lines can be projected on to the screen at one time, each line consisting of 45 printed characters. Operation, using punched tape input, is at an average speed of 66 words per minute.



Paragon A.D.P.

Since 1886 Paragon have pioneered the integration of original data recording.

In the Retail field Paragon Check Books provide the most efficient and comprehensive source of documentation whilst Paragon experience in modern, high speed data processing enables A.D.P. executives to use Paragon precision printed continuous forms with confidence in all electric and electronic Output Units.

'Formaliner'* Controlled Carbon Form-Feed — a further development of Paragon Data Processing methods — provides fast, continuous and reliable multi-copy Output at the final stage.

**The word 'Formaliner' is a Registered Trade Mark*

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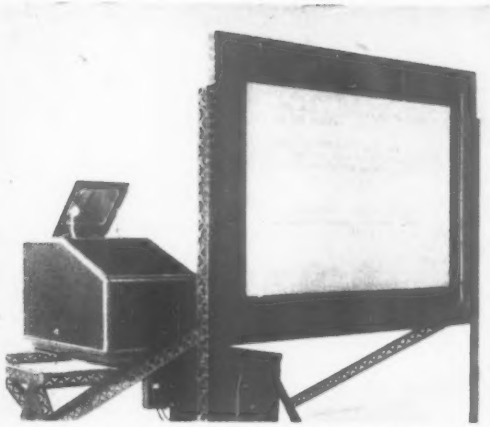


As shown on TV

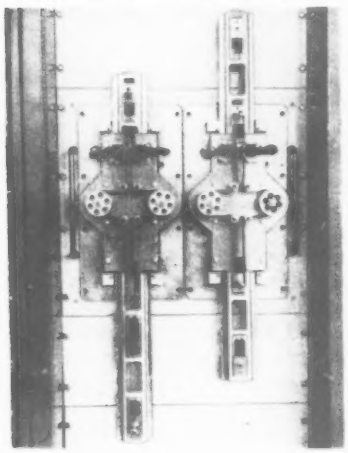
Both projection and printing units are housed together as an integral unit in a metal cabinet which measures 31 by 19 by 18 inches. Cost of equipment is approximately £900.

For further information tick SO3 on the reader enquiry coupon on page 39 or write to:
Creed and Co Ltd.
Telegraph House,
Croydon,
Surrey.

Novel Data Recording Equipment

A MAGNETIC tape recording/reading system, designed to link up with any data processing system, is announced by Redifon's computer department. The equipment may be used for data storage, correlation analysis, and for other digital/analogue application.

Sprocket wheels control tape



The system uses 35 mm. sprocket-punched magnetic tape. This is able to accommodate 16 recording tracks side by side, so that recording may be in parallel, recording in several channels carried on simultaneously, using as many tracks as there are orders of digits or channels.

The innovation of this system is the ability which it gives to move the tape forward, not at a continuous uniform speed as in the usual magnetic tape recording, but in discrete intermittent steps during recording or reading out.

The machine is an independent transportable unit with a tape storage capacity of 1,000 feet of tape. Cost is between £5,000 and £8,000 depending on the scale and scope of facilities required.

For further details tick SO4 on the reader enquiry coupon on page 39 or write to:
Redifon Ltd,
Computer Department
Gatwick Road,
Crawley,
Sussex.

Sterling Multiplier

BRITAIN is the biggest single market for the Swedish Addo Company, whose products are marketed here by Bulmers Calculators. For that reason the requirements of customers using sterling currencies receive particular attention; recently it has been found that there has been a need for a machine which can be attached to standard Addo machines without affecting their performance, in order to multiply automatically certain quantities with sterling amounts. The new sterling multiplier unit, developed by Addo ADP division, is the result, and will apply 'short-cut multiplication methods' to the problem.

The decimal multiplier, which can be a decimal whole number up to 9999, is entered on the keyboard in non-add. Next the sterling multiplication, any amount from 1d up to £999 19s 11d, is also entered in non-add. The operator then depresses the non-add key and the multiplication takes place.

The multiplying time for these calculations is fast, averaging about three seconds, with a maximum time—including printing out—less than eight seconds.

The unit, which is a free-standing unit measuring two feet by one foot by one, can be electrically connected to any sterling add-listing or accounting machine fitted with sterling input and output, including non-print and clear solenoids.

For further information please tick SO5 on the reader enquiry coupon on page 39, or write to:
Bulmers (Calculators) Ltd.
Empire House,
St Martin's-le-Grand,
London, EC1.

READER ENQUIRY SERVICE

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Please send me further information on

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SO3... SO4... SO5...
SO6...

Please advise me on the following additional problem

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Name

Company

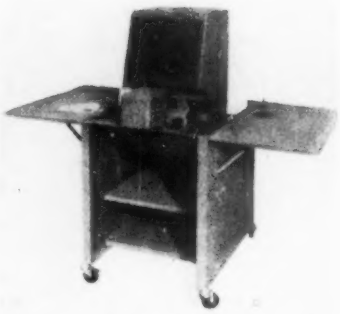
Position

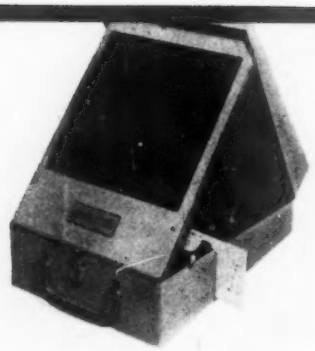
Address

NOW MAIL THIS COUPON TO: AUTOMATIC DATA PROCESSING, *Reader Enquiry Service, Mercury House, 109-119 Waterloo Road, London, SE1*

Cards and Microfilm

AT the recent Industrial Photographic and Television Exhibition some of the new Filmsort equipment that Minnesota Mining and Manufacturing Company have been importing from their American subsidiary was on show. This equipment covers the whole range of microfilm handling, mounting on tabulating and edge-punched cards, making copies, so that the master can be retained, screen reading, etc.





▲ *The Filmsort Inspector*

◀ *The Uniprinter 085*

The Filmac 200—shown for the first time at the BEE—aroused some interest, due to the news item that this equipment was being used in BOAC for studying the engineering drawings of the Boeing 707. The drawings were photographed on to microfilm, and the microfilm mounted on tabulating punch cards. In this way they were flown across the Atlantic to Britain at a fraction of the cost and freight space that they might otherwise have needed. The 200 reader-printer which has enlarged screen image and push-button operation was used by BOAC for reading and reconversion.

Among other equipment on the stand was "Sam," the semi-automatic optical mounter that allows you to check on the screen the microfilm print which you require—with a magnifying glass traversing the screen for detailed examination—and following the manual insertion of the punched card, will automatically cut and mount the print. Another useful small piece of equipment was the Uniprinter 085 which enables additional copies to be made in seconds of the mounted microfilm, so that the original card need not leave the department.

For further information, tick SO6 on the reader enquiry coupon on page 39, or write to:

Minnesota Mining and Manufacturing Co Ltd.
3 M House,
Wigmore Street,
London, W1.

What can we learn from the United States?

continued from page 15

pendent of the main flow of data processing. Current developments in business forecasting and other management planning techniques appear likely to increase the appeal of service centres. So far, most of the accounting work seems to have been carried out at those centres which have installed a computer to supplement established punched card services. Typical accounting applications have been payroll, stock control and sales analysis—procedures normally isolated from the remainder of the data processing in the organisation.

Some service centres sell time to organisations which have similar computers to help out during peak loads and breakdowns. It also seems probable, as the care necessary in the planning stages is more generally appreciated, that organisations working on feasibility studies or awaiting the delivery of a computer will make greater use of service centres to try out routines or to get basic data into the appropriate storage medium.

GOVERNMENT'S ROLE

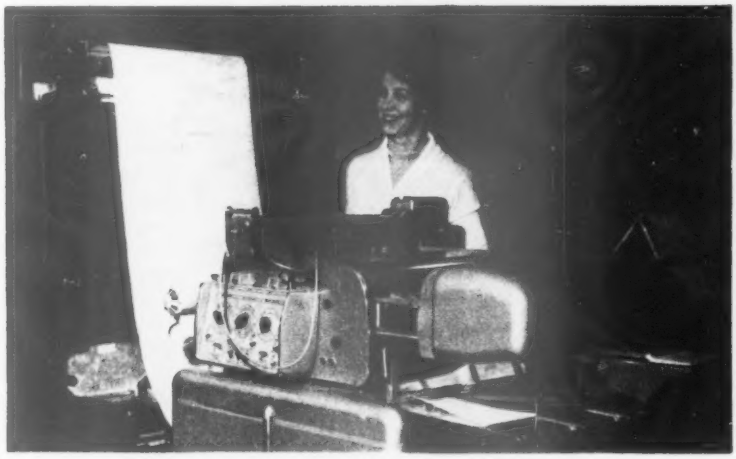
Government, because of its need to handle enormous volumes of civil and military data, is by far the largest actual or potential user of data processing equipment. Therefore, in the United States as in most European countries, Government, whether it likes it or not, cannot avoid exercising a powerful influence over the pattern of data processing development. In its turn, industry must inevitably be influenced by the lead of the Government in supporting or ignoring new developments.

The pioneer work carried out in the EDP field by the United States Government installations has played a major part in assisting equipment development. In fact, the Government's enlightened patronage—both in supporting research and in encouraging competition between suppliers to an extent that is stimulating without being wasteful—has greatly influenced the rate of progress.

In all, over 350 computers have been ordered or installed by government departments in the United States for routine data processing work of

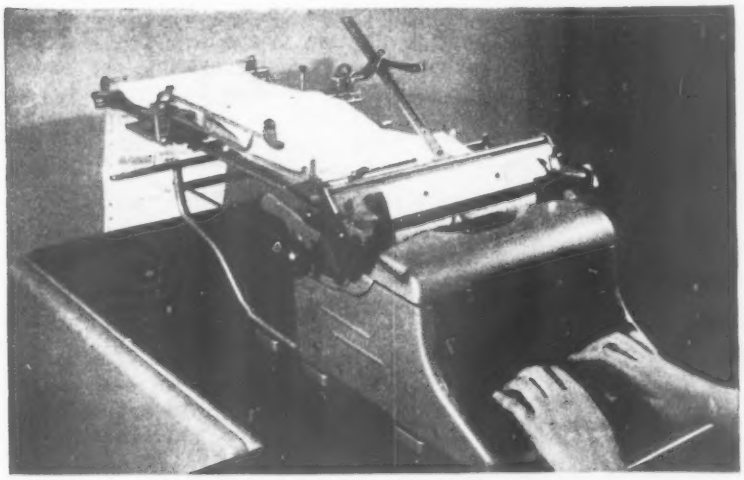
continued on page 42

Seen any good forms lately?



Do your business forms meet the needs of the Company as well as they might, or are they taken for granted?
Why not have specimens of all forms used brought in to you for a detailed check. See if they stand up to objective examination; changing patterns of business can easily outmode the original purpose of the forms. To aid you, technical advice is freely available for the asking. Catlins specialise in the design and manufacture of continuous stationery and multiple cut sets to individual needs; a talk with one of their experts may well result in a faster flow of work.

AUTOMATIC DATA PROCESSING EQUIPMENT needs continuous stationery processed to very exacting limits; it needs Cat-Tab stationery, tailor-made to suit each machine. Here Cat-Tab Continuous Stationery is being used on the ICT Tabulator and the Bowe SV 2002 Form Handling Machine.



CONTINUOUS STATIONERY used on billing machines will substantially increase output. Cat-Tab stationery designed for this attachment reduces manual operations to a minimum and ensures a fast output of completed forms.

May we arrange for a trial demonstration on your own machines?

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TBW C17

What can we learn from the United States ?

continued from page 40

an administrative nature. Most of the applications involve the handling of very large volumes of data, and the main justification for many computers is their ability to do this rapidly, efficiently and economically rather than their capacity for integration.

A particularly interesting development is in the Department of Defense, which controls the armed services and has policy responsibility for most Government EDP installations. There, a recently formed research unit is making thorough surveys of the experience of all the installations for which the Department is responsible. First, detailed questionnaires covering the operation of the installation and the savings achieved are sent out. These are followed by a visit from a case study team, which prepares a detailed report that includes any recommendations for improvement. Finally, follow-up visits are made to ascertain whether the recommendations have been implemented. The studies so far completed already constitute a valuable pool of experience which is available to all government users.

EDP AND UNIVERSITIES

It is well known that the United States is a long way ahead in providing training for management. Each year many thousands of graduates go on to two-year post-graduate courses in business administration.

Over 100 American university schools already have computers. Many more have access to nearby installations. As a result, in some of the leading engineering and business schools, most of the students now gain some direct knowledge of computers. This development has been greatly assisted by the enlightened policy of various computer manufacturers who have presented or lent equipment to educational establishments. In this way they subsidise a flow of trained personnel into industry and commerce who are conscious of the possibilities of EDP. In addition, they provide a source of programmers and computer engineers to meet their own staffing requirements.

BUSINESS GAMES

Computers have stimulated development of the new technique of management or business ' games ' which are being increasingly used for management training both at educational establishments and in industry. Most of these games are concerned with general management, though some are designed to teach specific techniques, such as production control and inventory management.

In a typical game, the computer program simulates mathematically a particular business environment. A number of teams, each representing a different company in the industry, competes. Each team is given the opening data about its own company and required to make a series of interrelated decisions on such factors as quantity and quality of its products, selling prices, amount to be spent on such items as the development of new products, advertising, and the levels of investment in fixed assets and stocks. As each round of decisions is completed, it is passed or transmitted to the computer installation. The computer uses the ' model ' to determine the resultant position of each company, say, three months later. Detailed results are calculated in a few minutes. These are passed back to each team, which analyses its own results and makes a further round of decisions for the next quarter. The game might cover a period of, say, five years, to allow time to illustrate the long-term effects which may be very different from short-term ones of the various teams' policies both internally and upon each other.

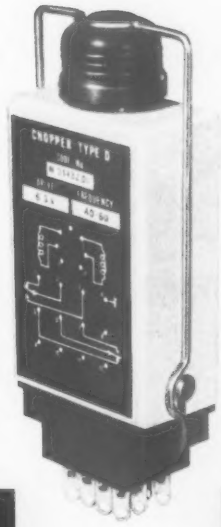
The quality of business games varies widely, but a well played game can be helpful in training management. Their greatest value is, perhaps, in bringing home to the players the relationship between various decisions which, in practice, are all too often made independently by different members of the management team. The games can be also valuable in illustrating the importance of planning ahead and how the long-term plans of any given unit are affected by the policies pursued by its competitors.

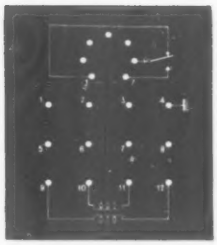
CHANGE MUST PAY

The potentialities of integrating data processing procedures offer a challenge which competitively-minded management cannot afford to ignore. But integration, like any other change, can only be justified to the extent to which it promises to pay off.

Equipment costs in the United States when converted at the current rates of exchange are almost identical to those in Europe. By contrast, the American levels of wages, salaries and other costs are usually at least twice as high as they are here. This means that in the United States it is much easier to achieve savings that provide an acceptable return on the cost of installation. Economic factors must, therefore, encourage a more rapid development of computers in the United States, as has been the case with punched cards. It is right that we should benefit as far as possible from American experience. But it is equally important that we should not apply it blindly and should take account of this costs differential.

micro-signal CHOPPER





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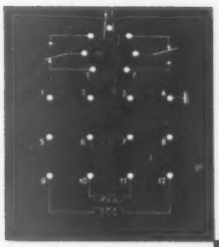
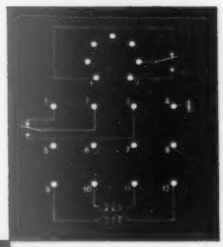
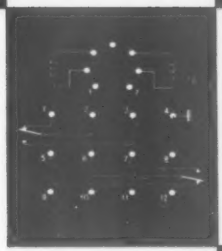
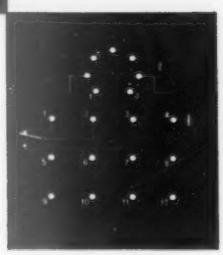




alternative coil/contact terminations





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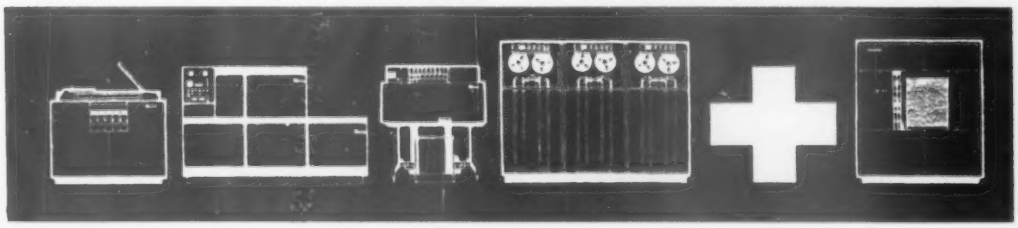

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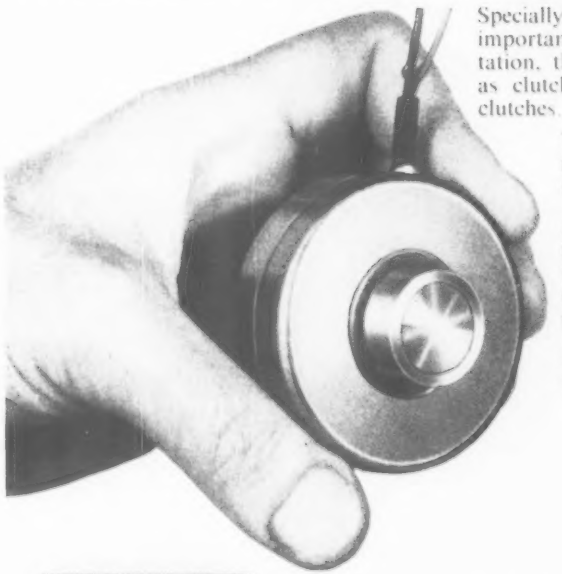

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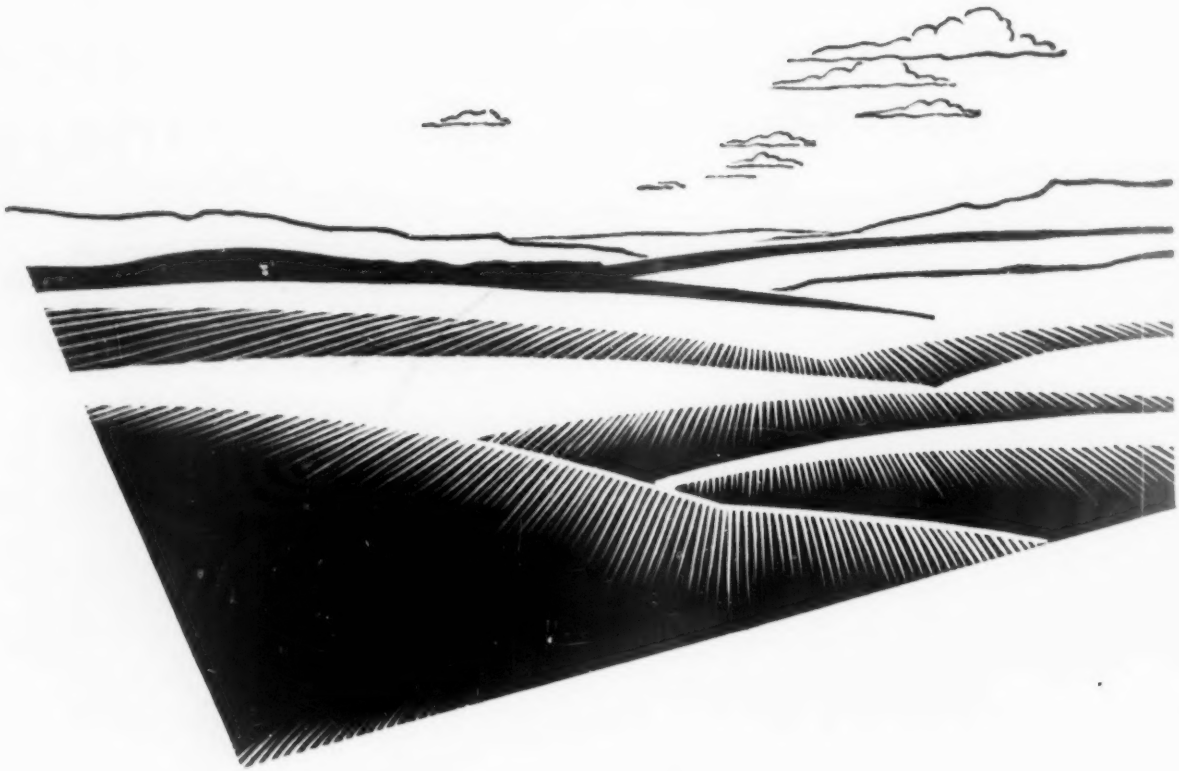

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